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OF THE

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THE PREFACE.

THE *Compilers of this Work took their First Design from* Bibliotheca Anatomica, Medica, Chirurgica, &c. *the Second Edition whereof was lately published by* Daniel Clericus *and* Jacob Mangetus, *in Two Volumes in Folio; but observing there were three times as many Tracts published in* England, France, Holland, &c. *which those Authors had not seen, or could reasonably be supposed to get, we collected all together that we thought might be useful or entertaining to the Reader, very few or scarce any of which have ever been in* English, *and these make so considerable a Part of the Work, which some we doubt too rashly complain against, and object, that we are too prolix, and repeat the same Things by different Authors over and over again, without considering that they treat one and the same Subject after a different Manner.*

We desire all others, as well as such, to consider the Nature of this Work, that it is a Library fitted for the whole Faculty or Profession of Physick and Surgery, and that we must make Use of several Authors, else it would not answer the Title; and if they please to read over the Contents in the following Pages, they will be convinced nothing could have been left out without deviating from our First Design. We begin with the Bones, not only because Dion, *and others the best modern as well as ancient Anatomists, with* Galen, *have done so, but because they are the Basis or Pillars on which the Body like a Structure is built.*

To obviate whatever may be objected, and shew the Reader the Use of this Work; First, we humbly conceive, that a judicious Physician or Surgeon, whom we suppose may be too busily employed in the Affairs of his Profession, to give himself Leave to study a whole Course of Anatomy, and especially such a Part of it as relates only to one particular Branch of the Profession, notwithstanding all this had rather be left to his Liberty to chuse what his Judgment directs him to out of the whole Anatomical Field, than be confined to such and such particular Parts by any one or more Authors upon such Subjects, or have a Work of this Kind so curtail'd, that he can neither find out the Beginning or End of the Design.

To answer the Intentions therefore of such Men, whom we hope for that End will be Encouragers of this, we have contrived, by taking in whatever was curious and necessary, though it has drawn this Volume to a longer Length than designed, not only to render the Work perfect and compleat, but also to ease the Practitioner of the Burthen of reading over whatever might be contained in the Whole, to find out only what might be necessary at any Time for his present Purpose, a perfect Index, to direct him to any or every Particular he shall

have

have Occaſion to enquire for, which we hope may in ſome Meaſure, if not entirely, anſwer the Cavils made againſt this Work, before the learned and accurate Reader has had Time to conſider the ſeveral Uſes and Advantages of an Undertaking of this Kind, and to give a ſolid Judgment of the Performance, for it is from ſuch we muſt expect the good or ill Succeſs of this Deſign, and not from Men who judge at Second-hand, that is, without Book, or thoſe who are altogether govern'd by Caprice and Humour, who like nothing but what they themſelves are Adviſers in, or at leaſt that is cook'd to their own fantaſtick Palates.

Theſe are not the Men we ſhall chuſe for our Judges, or court for Applauſe; but rather take upon us to adviſe them as Students, and not Proficients. And Firſt, We ſhall addreſs our ſelves to the Gentleman who is pleas'd to ſtudy Anatomy or Phyſick as an Accompliſhment, and not as a Profeſſion; and therefore for his Sake likewiſe we have provided an Index, that he may with leſs Trouble and Study turn to ſuch Things as he thinks only neceſſary to ſatisfie his Curioſity, without the Fatigue of conſulting thoſe tedious Proceſſes of Cures, &c. which relate only to Practice, and that more immediately to Surgery, which indeed, in this Volume, we were oblig'd to have principally Regard to, the ſubject Matter of the Bones leading us directly thereto, and without which, this Volume would not only have been imperfect, but frivolous and impertinent. Nor is that of the Bones the leaſt Branch of Surgery, as ſome, even of the greateſt of that Profeſſion, have made it, by not qualifying themſelves as they ought in the Cure of Luxations, in which moſt of them are ſo far from being Proficients, that it is to be fear'd they are too ignorant, that Branch of late Years having fallen into the Hands of a Sort of Men we call Bone-Setters, *which, though deſpis'd by the Surgeons, have and do daily exceed them in this Particular to a Miracle: So that the Cure of Luxations, or Reducing of a Bone, is ſo far from being one of the leaſt and moſt inconſiderable Branches of Surgery, that it appears plainly one of the greateſt and moſt eſteemable in its Conſequences; for there is no Part of Surgery, wherein there have been ſo many Miſtakes committed, as that of the Luxation, eſpecially in this Nation, wherein that ſeems to have been more particularly neglected or deſpiſed by Men of the largeſt Practice and Reputation; and therefore we have plentifully enriched this Volume with a compleat Account of* Luxations.

In the next Place, we ſhall addreſs the Student in Phyſick and Anatomy, and anſwer the Complaints ſome have form'd againſt this Work, eſpecially this Firſt Volume, as being clogg'd with too much Matter, and ſpun out to an unreaſonable Length. We juſtly own this might have been contracted into ſomething leſs a Compaſs, ſo as to have been brought into Ten or Twelve Months, had it not been purely out of Regard to the young Student in Phyſick, Surgery, and Anatomy, the Subject of this Volume being ſo abſolutely neceſſary for the Qualification, eſpecially of the Two later, and a great Accompliſhment as well as Advantage to the firſt, as he would become a finiſh'd or expert Phyſician either to a Fleet, Army, or Hoſpital.

And if the young Surgeon will give us Leave to deliver our own Opinions, conſonant to thoſe of our Authors we have made uſe of, we will aſſure him, That thoſe ſuperficial Relations of Caſes and Cures, which ſome think ſufficient to inſtruct them in order for Practice, are ſo far from making him a Proficient in his Art, that ſuch a ſlight Study only is enough to ruin him; firſt, by making him Opinionative of his own Worth, the ſureſt Bar to future Acquirements, and then rendring him Dogmatical, which is of dangerous Conſequence to make a Man miſcarry in his Practice, becauſe he will then find it a difficult Thing to ſubmit himſelf to a Conviction of his Errors. Beſides this, the young

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The PREFACE.

Surgeon ought never to complain of having too many Cases or Relations of one and the same Fact, and the different Methods of treating the same, because he will find them all short enough when he comes to compleat the Cure, and perhaps would then secretly wish for some larger and fuller Accounts, that would instruct him in the minuteſt Circumstances; for in that Profession, sometimes those very Things that appear the most trivial and circumstantial, prove to be of the last Moment, therefore the Knowledge of them are of great Consequence.

The Anatomist, if either he designs this Study for Use or Curiosity, can never with any Pretence of Reason pretend to find Fault, that his Instructions are too full, and that it will take him up too much Time and Labour; for he that pursues Anatomy with a Design to arrive at any Perfection, must never think of coming at it without Reading and Application, the first of which is not to be done from short imperfect Abridgments, but from a compleat, yet concise, Description of the Parts handled by the best Authorities. And this is the Scheme we have taken in this Volume of the History of the Bones, and their Cures, as the most solid and, indeed, only Foundation for Surgery and Anatomy: For the Reader is desired to consider, when he blames the Prolixity of the Work, That this is the largest Field of Anatomy, and as it is the least cultivated, has been, till of late Years, the least understood; therefore the Reader can never with Justice complain against the effectual Prosecution of a Work so necessary and curious, in order to which, there was a Necessity of quoting all the various Authors of any Authority that have writ upon the Bones, and that not barely cursorily, and by Scraps, but with Effect, so as to answer the Purposes for which they were designed, of Information and Instruction, and without which they had been of no Use, either to the experienced Practitioner or young Anatomist.

We engage to finish the whole in Two Volumes more, which will be contain'd in Twelve Months each, and no more: This we thought proper to acquaint our Subscribers with, that they may know the Extent of their Charges. The Advertisement we have given at the latter End of this Volume, and which will be inserted in the succeeding Months, will show what the Two next Volumes will contain. In short, There will be above Fifty Tracts of particular Parts made use of; as relating, first, to the Stomach, Cancers, Fistula's, Diseases of the Eyes, Ears, Guts, Worms, Wind, Cholick, Stone, Gall, Chyle, Urine, Pulse, &c. all by the best Modern Authors, which were never Englished before, and which no Subscriber can procure under Fifty Times the Value of the whole Work, when compleated.

The Subscribers Names, Places of Abode, &c. shall be printed to each Volume, with a short Index, Contents, &c. as there is to this; and to the third and last Volume, a general Index shall be added. Persons may now compleat their Sets for this First Volume, or have it entire, Bound or in Quires, and so continue them till the Three Volumes are finished; for they now know their Charge. Beside, to encourage any Person to be a Subscriber, we promise any Tract they propose to us shall be inserted, or any other Pieces of Value, in whatever Language it is, that they think proper should be done, shall be faithfully translated, and added to the rest, with a grateful Acknowledgment of the Favour, if sent to John Nutt *in the* Savoy, *or* John Morphew *near* Stationers-Hall, *paying Postage and Carriage.*

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The

The Introductory PREFACE TO THE *Bibliotheca Anatomica, Medica, Chirurgica, &c.*

IT ſeems almoſt ſurpriſing, that *Anatomy*, which by the general Conſent of the moſt celebrated Naturaliſts, as well as Phyſicians of all Ages, has obtained the Title of being one of the main Foundation Pillars of Phyſick as well as of Chirurgery, ſhould nevertheleſs not eſcape the malicious Cenſures and Reflections of ſome Perſons, who notwithſtanding they are ſufficiently ambitious of being counted great Phyſicians, yet are ſo far forgetful both of themſelves and their Profeſſion, as either quite to neglect the Anatomical Obſervations as uſeleſs, or at leaſt to repreſent them (in relation eſpecially to our Modern Inventions and Diſcoveries) as ſuperfluous, and little conducing to the happy Succeſs of the Practice of Phyſick, and conſequently to the Cures of moſt Diſeaſes.

Thoſe that thus vilify, and as far as in them lies would mangle and rob the Profeſſion of Phyſick of one of its moſt noble Parts, may be diſtinguiſh'd into Two Sorts: The Firſt are the Chymiſts, and their Followers, who having their Brain intoxicated with their *Panacea's*, or univerſal Medicines, Secrets, *Specificks*, *Noſtrums*, and ſuch-like *Chimera's*, have revived the ancient Sect of the *Empiricks* among us, and without troubling themſelves much about the true Knowledge of the natural Conſtitution of the Body, the Structure of its Parts, and their Functions, (which, if impaired, prove the Cauſes of ſo many Diſeaſes) have confined the Study, as well as the Practice, of our noble Art, to the narrow Bounds of certain well-experimented (as they are pleas'd to call them) Chymical or Pharmaceutical Preparations. The ſecond Sort are ſuch as, treading the Foot-ſteps of the ancient Sect of the *Methodici* among the Phyſicians, prefer their own Eaſe before the Publick Good; and being deterr'd by the vaſt Extent of this Study, and the Intricacy of the Anatomical Obſervations, content themſelves with a ſuperficial Knowledge of moſt Things that appertain to their Profeſſion: And as they are ignorant of the niceſt and moſt uſeful Points relating to it, ſo they cover their Neglect and Ignorance with the ſpecious Title of being great and aſſiduous Practiſers of Phyſick, and Patrons of Antiquity; to wit, ſuch as, laying aſide all that is ſuperfluous or of little Uſe in their Profeſſion, centre all their Study and Endeavours, if you will take their Word for it, in the Improvement of what is more immediately conducing to the Practice thereof.

The chief Deſign of the following Work being no other than to give our Reader a compleat View of the moſt abſtruſe Scrutinies, Enquiries, and Diſcoveries, that have been made (of late Years) in Anatomy, as well as in the Practice of Phyſick, founded upon theſe Diſcoveries, (as ſhall be ſhewn more at large anon) we will enter upon an Examination of ſome of the main Objections that are made by thoſe Demi-Phyſicians, againſt the Uſefulneſs of theſe modern Anatomical Obſervations, by which they endeavour to deter and ſeduce the young Students in Phyſick from the true Path, which will infallibly lead them to the right Underſtanding of the Oeconomy of our Body, and conſequently to the Diſcovery of its preternatural State, and of ſuch Diſeaſes as are its immediate Attendants.

And here, before we enter upon a particular Diſquiſition of their Objections, we muſt obſerve, That as theſe Gentlemen are ſenſible that the Uſefulneſs of Anatomy in general in Phyſick is ſo obvious in ſeveral Diſtempers, but eſpecially in Chirurgery, that to deny it, would be no leſs than to accuſe themſelves of a palpable Ignorance and Stupidity; they have pitch'd upon another Expedient, *viz.* to limit this vaſt and noble Part of Phyſick to very narrow Bounds, to wit, to the Conſideration only of the Situation, external Figure, and Connexion of the Parts, call'd by the ancient Empiricks, *Anatomia Fortuita*, ſuch as ſuited beſt with that ſuperficient Knowledge they have only attain'd to in this Study; and levelling moſt of their Engines againſt the modern Diſcoveries in Anatomy, endeavour to repreſent them as uſeleſs, or at leaſt ſuperfluous, to the Practice of Phyſick.

'For, *ſay they*, after many Years have 'been expended by ſome in the Scrutiny of 'ſeveral of the *Viſcera*, let us allow them 'to have, by their frequent Diſſections and 'Inſpections of them, attained to a more 'exact Knowledge of their Structure; but 'at the ſame time let us conſider alſo, whether 'they have been able to diſcover any other 'Uſes of them, than what were known be'fore? Or if they pretend they have, Whe'ther any conſiderable Advantage has been 'acquired by them for the Improvement of 'the Practice of Phyſick? For after ſo much 'Time and Labour ſpent, we ſhall find 'that there are many Parts belonging to our 'Body which ſtill retain their former Fun'ctions. Thus, for Inſtance, *Galen* has 'made the Kidneys the Organs of the Secre'tion of Urine. In the laſt Age, *Bartholo'mew Euſtachius* did diſcover certain *Canali'culi*, or *Tubuli*, in the Subſtance of the 'Kidneys, which were not known to *Galen*. 'Some of our more modern Anatomiſts have 'alſo found out in them certain *Glandules*; 'but notwithſtanding all this, the Kidneys 'ſtill retain their former Function of Se'cretion of Urine. Neither are the Cures 'of the Diſtempers of the Kidneys now per'formed with better Succeſs, than they were 'before theſe Diſcoveries were made. The 'ſame Thing (*ſay they*) may be ſaid of the 'Breaſts, the Teſticles, and the Liver, in 'which all the new Diſcoveries of certain 'Veſſels, of ſome Ciſterns, of ſo many 'Ducts, Glandules, and *Capſulæ*, have not 'been able hitherto to ſhew us any other 'Uſes than what they had before.

'The Teſticles have, by the unanimous 'Conſent of all the ancient Phyſicians, 'been dedicated to the Generation of the 'Seed: And *Galen* has taught us, that the 'Liver ſeparates the Bile from the Blood: 'And after all the Enquiries, Lucubrations, 'and Pains taken by our modern Anato'miſts, they have not been able to aſſign 'them any other or better Uſes; and con'ſequently their Scrutinies and Diſcoveries 'have not been of any Benefit to the Pra'ctice of Phyſick.

'But (*add they*) to ſhew that even in 'thoſe Parts, in which they moſt manifeſtly 'have diſcovered ſome Uſes, very different 'from what have been allotted them by the 'Ancients, after many laborious Sections 'and Inſpections, they have not been able 'to make any conſiderable Improvement, as 'to the Practical Part of Phyſick: Let us 'enter upon an Examination of the *Pancreas*, 'and the *Spleen*. That the *Pancreas* ſhould 'be deſigned only for the Stomach to reſt 'upon, like as upon a Pillow, is what ſcarce 'any Body will maintain in our Time, 'ſince *Wirſungius* has quite overthrown that 'Opinion. In the ſame Manner, Who is 'ſo ignorant at this Time, as to maintain 'that the Spleen is the Receptacle of that

Matter

'Matter which is conveyed thither by the 'Splenical Branch? This being directly con-'trary to the Circulation of the Blood, and 'to thoſe conglomerated Glandules that 'have been detected there. But what of all 'this? For ſuppoſing the modern Anato-'miſts have diſcovered ſome Errors of the 'Ancients, in relation to the Uſes of theſe 'Parts, it does not follow that therefore 'they have found out the True: For 'the true Uſe of the *Pancreas* does not de-'pend on the Diſcovery of its *Ducts*, no 'more than that of the Spleen does on its 'Glandulous Subſtance, or on the Circula-'tion of the Blood: So that if one *Hypo-'theſis* labours under no ſmall Difficulties, 'the other is ſubject at leaſt to as many Ob-'jections.

'If we examine, *(ſay they)* the Patholo-'gy of the Spleen, and of the *Pancreas*, and 'take a View of the Diſeaſes attributed to 'both theſe Parts; to wit, the *Scirrhus*, In-'flammations, the *Carcinoma*, Ulcers, Pains, 'and Wounds, and conſider duly what 'Progreſs has been made by theſe new Diſ-'coveries in the Cures of them, 'tis well if 'we don't find, that they were treated with 'better Succeſs before the Anatomy of theſe 'Parts was enrich'd by theſe new Obſerva-'vations, than now they are.

'Beſides that, it is evident, That the Cog-'nition of the Uſe of any Part is not abſo-'lutely neceſſary to the Cure of Diſeaſes; 'for were it ſo, the Diſtempers of the 'Spleen, as well as of the *Pancreas*, would ne-'ver be cured, becauſe the Phyſicians are 'ignorant to this Day of the true Uſe of 'theſe *Viſcera:* And what has been men-'tioned concerning the Spleen and the *Pan-'creas*, is applicable to all the other Parts; 'the Uſes of which have not as yet been 'diſcovered.

Theſe are ſome of their ſpecious Preten-ces, wherewith they would fain cover their own Ignorance; but all theſe will appear very frivolous when we ſhall find them put to the Touch-ſtone, according to the Senti-ments of that great and famous Anatomiſt *Malpighi*. Thoſe who ſet their Engines at work againſt the moſt abſtruſe and moſt uſeful modern Diſcoveries in Anatomy, finding themſelves obliged to own, that the Cognition of the Structure of the *Viſcera*, as well as the Fabrick of the other Parts of the Body, is much improved of late Years, had no other Way left them to undervalue ſo great and ſo uſeful a Work, than by im-poſing upon the World a notorious Falſity; *viz. That the Uſes of moſt Parts, after all the new Enquiries and Diſcoveries, are the ſame now that were aſſigned to them by the Ancients*; as will appear ſufficiently, if we make a due Compariſon betwixt what has been ſaid by the Ancients, as well as the Moderns, con-cerning the *Viſcera*, and ſome other Parts of our Body.

To begin with the *Kidneys:* Theſe were defin'd by the Ancients to be certain *Viſcera* of a compact carneous Subſtance, which by a peculiar Sympathy did attract the Seroſity from the *Vena Cava*, by Means of the *Emul-gents*, for their own Nouriſhment, juſt as we ſee Dogs to delight in, and be nouriſhed by, Excrements.

According to the Moderns, the Kidneys are a Compoſition of ſmall Glandules, from whence ariſe the excretory Veſſels, and make up a glaudulous Body. The Blood being convey'd by the Arteries to the Glandules, its aqueous Parts, ſaturated with ſaline and ſome volatile Particles, are receiv'd into their Paſſages; whilſt the Overplus is carried back to the Heart by the Veins.

The Liver, according to the Ancients, by an innate Faculty, did introduce an Alter-ation in the Chyle, and turn'd it into Blood. And becauſe in all Manner of Concoctions there is ſeparated a twofold Excrement, *viz.* a groſs and a thin, therefore the *Bile*, as the groſſer Excrement, is thrown off into the Inteſtines, but the *Serum* remains with the Blood.

The Uſe of this bileous Excrement is, to ſtimulate the Parts for the better Excretion of the Excrements.

Now let us hear what the *Liver* is, accor-ding to the modern Anatomiſts. It is a Gland compoſed of innumerable *Folliculi*, which, by Means of their porous Structure, ſeparate the Bile carried thither by the *Vena Portæ* and the *Arteria Cæliaca*. The Bile is a moſt uſeful and neceſſary Ferment, compos'd of alcatiſated Salts, which being ſeparated by its peculiar Veſſel, *viz.* the *Porus Bilearius*, is carried to the Inteſtines. Its Uſe is, by

the Help of its ſaline Parts, to attenuate the Particles of the Chyle, and to introduce an Alteration in the Structure of their ſmaller Parts, ſweetening the Chyle, and to promote its Precipitation.

Now I will appeal to any rational Body, whether there is not a very remarkable Difference betwixt the Deſcriptions, as well of the Structure of theſe Parts, as of their Uſes; and how far this Difference introduces an Alteration in the modern Practice of Phyſick, we will ſhew hereafter by undeniable Inſtances, after we have examined their Three Objections, by which they pretend to prove, or at leaſt to corroborate their Aſſertions levell'd againſt our modern Anatomical Diſcoveries.

Fearing, not without Reaſon, that their firſt Aſſertion would not long ſtand the Teſt, they thought fit to grant, that the Uſes attributed by the Ancients to the *Pancreas* and the Spleen, were juſtly exploded by the modern Anatomiſts: But ſtill to uphold their tottering Cauſe, they tell us, *That though the Moderns had diſcover'd ſome Errors concerning the Uſes of theſe Parts, they had not as yet found out the true; for the the Uſe of the* Pancreas *is not to be diſcovered by its Ducts, nor that of the Spleen by its glandulous Subſtance; nor by the Circulation of the Blood.* This Aſſertion favours very much either of Ignorance or of Malice.

For who can be ſo ſtupid as not to be ſenſible, that ſince our modern Anatomiſts have diſcovered the *Pancreas* to be a Gland, provided with its proper excretory Veſſels, that the ſame muſt needs be deſigned for the Secretion of ſome peculiar Juice? And it being evident by the Diſſections of Animals of different Kinds, that this Juice is carried to the *Duodenum* and mix'd with the Bile, it muſt be undeniable alſo, that the Uſe of this Juice is intended for the Benefit of the Chyle; ſo that the general Uſe of the *Pancreas* is plainly diſcovered by the Help of the Anatomical Obſervations made of its Structure: All which was altogether unknown to the Ancients. And as for its particular Uſe, from what has been obſerved concerning the peculiar Qualities of this Juice, and what Alterations the Defect thereof produces in our Oeconomy, as well as when it is corrupted, the ſame may eaſily be diſcovered by any one, that has but a moderate Inſight into the Operations of Nature in humane Bodies. For this Juice conſiſting for the moſt part of ſaline Parts, intermixt with ſome acid or auſtere Particles, theſe being mix'd with the Bile, not only introduce a Fermentation, but alſo a Precipitation, of the fuculent Parts of the Chyle. Thence it is, that for Want of this Juice, the Chyle is either not diſtributed as it ought to be, or elſe being not duly clear'd of its excrementitious Parts, and conſequently not fit for Nutrition, produces a *Maraſmus*, *Cachexy*, and other ſuch-like Diſeaſes. But if our Adverſaries have a Mind to carp at this particular Uſe of the *Pancreatick Juice*, as not coming up to the Certainty of a demonſtrative Proof, I would have them remember, That if the ſame Objection ſhould be made to the Ancients in Things of this Nature, they would be obliged to retract moſt, if not all, their Aſſertions concerning the Uſes of the Parts, and their preternatural Diſpoſition. Beſides, that Mathematical Demonſtrations are not requir'd from a Phyſician, in ſuch Caſes where 'tis next to an Impoſſibility to meet with them, or at leaſt not till Time and Experience may open a Way to them: A living Inſtance whereof we have in Mr. *Lewenhoeck*'s Obſervation concerning the Uſe of the Bile, and its corrective Quality of the Acidity of the Chyle; to wit, that he had obſerved a great Quantity of acid Salts amongſt the Aliments in the Stomach, but never could meet with any in the Chyle after it had paſſed the *Duodenum*. However, thus far they are forced to grant our Aſſertion, (it being paſt all Contradiction) that the *Pancreas* does ſeparate without Intermiſſion a certain *ſaline* Juice, intermix'd with ſome *acid* Particles, which, by the Means of its Duct, it conveys to the Inteſtines when it is mix'd with the Chyle; which as it evidently diſcovers the Uſe of the *Pancreas*, ſo it leads us to the Diſcovery alſo of the Uſe of its Juice, as has been mentioned juſt now: And the ſame may be applied under certain Circumſtances to the Spleen alſo.

But to give the moſt ſpecious Colour they could to their Sophiſtications, they are not aſhamed to put upon the World a moſt notorious Falſity, *viz.* That not only the *Scirrhus*,

Scirrhus, Inflammations, Obſtructions, Ulcers, Wounds, and Pains of the *Pancreas*, as well as of the Spleen, (or that might admit of ſome Excuſe) but alſo the Diſeaſes of the Breaſt, ſuch as the Pleuriſy, the *Aſthma*, and the *Peripneumonia*, and in ſhort moſt other Diſtempers incident to humane Bodies, *were at leaſt as ſucceſsfully, if not with better Succeſs, cured in ancient Times, than they are now.* If they had had ſo much Modeſty and true Senſe as to have told us, That the Moderns were not always ſucceſsful in their Cures of the Diſeaſes of the Spleen, and of the *Pancreas*; notwithſtanding all their new Diſcoveries made of the Structures and Uſes of theſe Parts, we would not have entred into a Diſpute with them about the Matter, but told them only, That ſuppoſing they were not cured at all Times, this did not imply, that we were ignorant of the Uſes of theſe Parts; becauſe the Malignancy or Stubbornneſs of a Diſtemper proves often too prevalent for humane Art, even when the Diſeaſes, as well as the affected Parts, are evidently known to the Phyſician. Thus in the Heart, and in the *Vena Cava*, the *Polypus* is very manifeſt, the Inciſions of the Nerves, the Dilatation of the Artery, and other ſuch-like Diſtempers, are evident, as well as the Uſes of the Parts, where they happen, and yet are not curable by the Art of Phyſick. The only Thing a Phyſician has to do in ſuch Caſes as theſe, is to have Recourſe to that Part of Phyſick which is call'd *Prognoſis*; according to which, it is ſufficient for a Phyſician to pronounce ſome certain Diſeaſes incurable; though they have their Riſe in ſuch Parts, the Uſe whereof is not unknown to him. But ſince they are ſo bold and aſſured in their own Opinion, as to charge us with a notorious Falſity, the beſt Way to diſcover and to expoſe it to the Cenſure of the judicious World, is to enter upon a regular Compariſon of the different, if not quite contrary Methods made Uſe of by the modern Phyſicians in the Cures of divers Diſeaſes, from what was done by the Ancients; in the ſame Manner as we did give you before, a ſhort *Specimen* of the Structure and Uſes of the Kidneys, and of the Liver, both according to the ancient and the modern Anatomiſts Opinion.

To begin therefore with the Method uſed by the Ancients in the Cure of the Diſeaſes of the Spleen: They uſed to let Blood frequently, and to apply very deep, both actual and potential Cauteries to the affected Part, which, inſtead of anſwering the deſired End, moſt commonly was attended with ſtubborn and long-continued Fluxions to that Part where theſe Operations were performed. And as for their internal Remedies, let us hear what *Celius Aurelianus* ſays in their Behalf. This Author ſpeaking of the Diſeaſes of the Spleen, and how they were treated by the moſt celebrated Phyſicians of his Time, ſays; 'They give the Patients Draughts 'of various Compoſitions, which they 'reiterate from Time to Time, till they 'have quite diſturbed the Oeconomy of the 'Stomach by a vaſt Variety of Ingredients, 'diſcompoſed the Tone of the Bladder, and 'reduced the whole Body into a Cachexy.

But according to our modern Practice, our Phyſicians, who are better acquainted with the Structure of the Spleen, make it their chief Endeavour in theſe Diſtempers to reſtore to the Blood its due Volatility and Circulation, by preſcribing abſorbent and volatilizing Remedies, and to ſtrengthen the natural Tone and Motion of the carneous Fibres.

We will give you another Inſtance of the Diſtemper of the Kidneys; to wit, of the *Profluvium* of Urine, call'd by ſome the *Spurious Diabetes*, which will ſet before our Eyes ſome certain Effects owing to the modern Diſcoveries in Anatomy, and conſequently will convince the World of the Nullity of the Aſſertions of our Anatomiſts; one of which was, *That notwithſtanding all the Pains taken by our modern Anatomiſts, the Uſes of the Kidneys were ſtill the ſame; and the Cures of their Diſtempers were not performed with better Succeſs now than before.*

The Ancients would needs attribute this Diſtemper to the immoderate Heat of the Kidneys; by which Means they imagined the *Serum* was attracted in too great a Quantity. Unto this, ſome among them were pleaſed to add a certain acrious Humour, which being lodged in the Subſtance of the Kidneys, did without Intermiſſion

termiſſion irritate or ſtimulate the *Facultas Expultrix*, or *Excretory Faculty*, as they call it; but what it means, they have never been able to explain as yet to any Purpoſe.

The Method uſed by the Ancients in the Cure of this Diſeaſe, was to order the Patient good Store of adſtringent and refrigerant Remedies, and to make them abſtain from any thing that was liquid.

But our modern Phyſicians being made ſenſible by our late Diſcoveries in Anotomy, that the ſmall Glands in the Subſtance of the Kedneys are framed ſo, as to admit through their Pores or Paſſages the aqueous Parts carried thither by the Arteries, intermix'd with ſome ſaline and volatile ſpirituous Parts, (as is evident by the Analyſis of the Urine;) and that if by Reaſon of any extraordinory Fermentation of the Blood, or by ſome other Cauſe, a greater Quantity of theſe ſaline and ſpirituous Particles is thrown out by the ſanguineous Maſs upon thoſe Glands, theſe will vellicate and open their Way into their Pores with an uncommon Force, and conſequently convey thither a greater Quantity of Urine. Hence it is that our modern Phyſicians take a more ſure and effectual Method, ſuch a one as is in all Reſpects agreeable to theſe Indications; for they order their Patients the plentiful Uſe of Liquids, and ſuch as approach neareſt to an aqueous Subſtance, in order to diſſolve and allay the Acrimony of the ſaline Parts, and prevent their Union or Coalition; whereas the Adſtringents preſcribed by the Ancients ſerved rather to promote their Concretion; but by the continued and plentiful Uſe of Liquids, this Diſtemper ceaſes.

And ſince we are now upon the new Diſcoveries made in the Kidneys, I ought not to paſs by in Silence a certain Diſcovery made of late Years in the Urine by the Help of the *Microſcope*, which will convince us in ſome meaſure, that the Uſe of the Optick Glaſſes is not ſo inſignificant in promoting the Anatomical Scrutinies into the Structure and Compoſition of the minute Parts, as our Antagoniſts would fain perſwade the World that they are.

'Tis very well known, that the ancient Phyſicians, who were very ſedulous and ſollicitous about the Inſpection of Urine, whenever they obſerved a Kind of a thin Film, not unlike an Oil, ſwimming upon the Surface of the Urine, they uſed, to the great Terror of the poor Patient, to pronounce no leſs than a Colliquation of the Fat, or *Adipous* Part of the Body; and accordingly invented a peculiar Cure: But with the Help of the *Microſcope*, this Film has been found to conſiſt only of ſome very minute arenoſe Particles of the Urine, which were not precipitated and caſt to the Bottom of the Urinary Veſſel, which, as you may eaſily gueſs, has put our Phyſicians upon a different Method of curing this Indiſpoſition.

We will give them ſome other Inſtances in the *Pleuriſy* and the *Aſthma*. 'Tis very well known, that the Seat of this Diſtemper has been moſt commonly fix'd in the *Pleura*, whence it alſo has obtained its Name: But by the frequent Diſſections of Pleuritick Perſons, made by our modern Anatomiſts, it is now put beyond all Diſpute, that we muſt look for the Cauſes and Reſidence of this acute Diſeaſe in the Lungs.

It is evident, that the Blood is protruded into the Lungs by the *Arteria Pulmonalis*, whilſt it is as yet mix'd with the Chyle and *Lympha*, and that it is there attenuated and intermix'd with certain very ſubtile Particles, ſeparated from the Air, and ſuch as are qualified to encreaſe its Motion; whereby the Blood being volatiliſed and rendred more fluid, paſſes with more Swiftneſs than before through the reticular Ramifications made by the *Arteriæ* and *Venæ Pulmonares*, and begins now to partake of the true Nature of the Blood; as may, among other Things, be proved by the Obſervations and Experiments made by ſome of our modern Anatomiſts upon the Blood, in which, by the Mixture and Affuſion of ſeveral Mineral Liquids with the Blood, they have Obſerved in the Blood ſuch volatile and nitrous Parts.

And here I cannot but forewarn my Reader, that when I ſpeak here of the nitrous Parts, theſe muſt not be miſtaken for ſuch as are contained in the vulgar Niter, or its Spirit, which, inſtead of volatiliſing the Blood, would induce a mortal Coagulation; but muſt be underſtood of ſuch pure nitrous Particles, as are produced by Way

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of Fermentation out of Urine, and ſome other Excrements, which are of a volatile and alcalious Nature, yet ſo as to participate ſomewhat of an acid; or rather it muſt be taken for that aereous nitrous Spirit, ſo much celebrated by Dr. *Willis*, *Mayow*, and many more of our modern Phyſicians, which renders the Blood more florid and fluid; whereas the Mineral Acids, ſuch as Vitriol, *&c.* will be apt to introduce a mortal Coagulation. And it is obſervable, that the Blood, taken by Venæſection from Pleuritick Perſons, is generally obſerved to abound in Acids, and at the ſame time to be defective in volatile Particles.

According to theſe Obſervations it is eaſily underſtood, that in caſe the Blood is overſtock'd with acid ſaline Particles, theſe will, by their coagulating Quality, retard its Motion in the ſmall reticular Veſſels, aud by degrees produce a total Stagnation of it in thoſe Parts; ſo that the Lungs being oppreſſed, and the Extremities of the Nerves put into a Convulſive Motion, were the Cauſes of thoſe Symptoms which are the uſual Attendants of this Diſeaſe. The modern Phyſicians direct their Cure according to theſe Indications; for they preſcribe ſuch Remedies as abound in volatile Particles, ſuch as are qualified to render the Blood more thin and fluid, or elſe ſuch as are apt to diſperſe and abſorb the acid Parts. The Remedies generally preſcrib'd by our Phyſicians are manifeſtly ſuch as the volatile Spirit of Hartſhorns, of humane Blood, of *Sal-Armoniack*, *&c.* ſuch Herbs as conſiſt chiefly of oleaginous Particles, the *Sanguis Hirci*, the *Fuligo*, teſtaceous Powders, *Antimonium Diaphoreticum*, Oil of ſweet Almonds, of Lineſeed, *&c.*

The Aſthmaticks ſtand alſo not a little indebted to our modern Anatomiſts, who have taken the right Way to put that Diſtinction of this Diſeaſe into the *dry* and *moiſt Aſthma*, into its true Light. The Pathology of the moiſt *Aſthma* is owing to the late Diſcoveries of the ſmall Glanduſes in the *Trachæa*, which at once has knock'd in the Head all thoſe Chimera's invented by the Ancients, relating to the Theory of this Diſtemper. And as for the dry *Aſthma*, Dr. *Willis* and others have by the only true Light of Anatomy ſhewn to the World, that we muſt look for its Origin in the Convulſions of the Nerves, of the intercoſtal Muſcles, and the Diaphragm. And 'tis not in the leaſt to be wonder'd at, that ſince the Cauſes of this Diſtemper, as repreſented by the Ancients and Moderns, are ſo oppoſite to one another, theſe ſhould take a quite contrary Courſe in its Cure when they preſcribe Opiats, liquid, aqueous, and mitigating Remedies.

To put this Matter, in relation to the Uſefulneſs of the late Diſcoveries in Anatomy, in reference to the Cures of Diſeaſes beyond all Diſpute, pray let us conſider for how long a Time the true Origin, and, as I may call it, the Head-Spring, of Catarrhs, has been concealed from the Eyes of the World, to the no ſmall Detriment of the poor Patients, till by the late Diſcoveries of the *Glandulæ Sublinguales*, the *Parotides*, and the ſmall Glandules in the Palate and Windpipe, it has been expoſed to the View of the Publick.

Thus the membranous Structure of the Lungs, which like a membranous perforated Sive ſeparates from the Air that Principle which volatiliſes the Blood, and by other peculiar Holes affords an Egreſs to thoſe Vapours and Particles which do not belong to the Compoſition of the Blood; as alſo by its reticular Labyrinth of the minute Sanguineous Veſſels, has given us a great Light and Inſight into the Cauſes of the *Aſthma*, the *Phthiſick*, and other ſuch-like Diſeaſes.

The Glands that have been diſcovered of late Years in the Lips and Face, repleniſh'd with a certain unctuous Liquor to moiſten the Skin, have been found ſometimes alſo to be impregnated with a ſharp *vitriolat* and *arſenical* Humour, which often produces very malignant Tumours: Theſe are much ſooner and better cured by the Inciſion of the Gland, than by all the Cauſticks they uſed to apply to them. The ſame Thing is obſervable in the Eye-lids, where, if thoſe ſmall Glandules are repleniſh'd with a morbifick Humour, they produce very malignant Tumours, being deſtitute of any excretory Ducts, whereby to diſcharge the noxious Matter. Theſe Tumours are alſo beſt cured by taking out the Glandules, which may be performed without impairing the carneous Fibres that move the Eye-lids. And I am

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aſſured, that if the Chirurgeons would exterminate all thoſe infected Glands by a manual Operation, which by degrees degenerate into Tumours of a malignant Nature, they would proceed with much more Eaſe and Safety.

The glandulous Structure of the *Pleura* and the *Peritonæum*, ſuch as it is repreſented and explained by me, (ſays the great *Malpighi*) does give us alſo a much better Inſight (among other Diſeaſes) into the Cauſes and Production of the aqueous Dropſy; for theſe beforeſaid Parts being provided with ſmall Holes in the Nature of Sives, in order to tranſmit through them into the Cavities which they encloſe, *viz.* the *Thorax* and the *Inferior Venter*, an aqueous Liquor to keep theſe *Viſcera* moiſt, and prevent their Conglutination, if they were not kept ſeparate from one another by this intermedious Moiſture. As often as either by reaſon of ſome Defect in the Pores, or ſome Indiſpoſition of the Blood, there is diſcharged a greater Quantity of the *Serum* than what can be diſperſed or carried off by Tranſpiration, there follows a Collection of theſe ſtagnated Humours, and conſequently a Tumour of the Two before-mention'd Concavities.

To prove this Aſſertion, let us conſider, That there are not wanting Inſtances, that when the Pores of the glandulous Membrane of the *Peritonæum* have been ſo far obſtructed, as to be rendred unable to inſtil into the Cavity of the *Abdomen* that neceſſary Moiſture, it has been detained in the Subſtance of the *Peritonæum* it ſelf, and occupy'd a Space full of an aqueous Humour.

Of this, Mr. *Nuck* has given us a moſt remarkable Inſtance (in the Ninth Book of his *Adenographia*) of a certain Woman, whoſe *Peritonæum* was found extended to ſuch a Degree, that it appeared like a large Bag: It contained a great Quantity of Water; and notwithſtanding its moſt exceſſive Diſtention, its Subſtance was thicker than in its natural State it ſhould have been, which muſt be aſcribed to the præternatural Diſpoſition of the *Folliculi*, which will always tumify when they are affected with ſome morbifick Humour. At the ſame Time, the Inteſtines being deſtitute of their natural Moiſture, appear'd as if they were quite empty, and contracted or ſtruck together.

From this Phenomenon relating to the Dropſy, as deſcribed by Mr. *Nuck*, we may take ſuch Indications, as will lead us to the probable Cure of this Diſtemper; to wit, by ſuch Remedies as are qualified to thicken the ſanguineous Maſs, and contract the Pores of the *Peritonæum*; as for Inſtance, the Juice of *Plantin*, and ſuch other vulnerary Remedies as uſed to be preſcribed in the other Species of the Dropſy. The famous Dr. *Charles Drelincourt*, with ſeveral other modern Authors of Note, have given us many more Inſtances of this *Species* of the Dropſy, ſeated in the Subſtance of the *Peritonæum*, together with their Cures, adapted to the new Anatomical Diſcoveries of that Part, too many to be incerted in a Preface.

For it is Time for us to proceed alſo to the Refutation of the Third Objection of our Antagoniſts; to wit, *That it is not abſolutely neceſſary and requiſite to the Cure of Diſeaſes, to know the Uſe of the Parts from whence they ariſe*: For if it were ſo, there would remain a great Number of Diſeaſes incurable, becauſe the Uſes of their Parts where they are lodged, is not known as yet to the Phyſicians.

Suppoſing we ſhould grant theſe Gentlemen for once, That the Cognition of the Uſes of the Parts where the Diſeaſe has its Riſe, or is lodged, is not abſolutely neceſſary to the accompliſhing of a ſucceſsful Cure of it; I hope they will at the ſame Time be ſo ingenuous as to confeſs, That at leaſt it ſtands us in no ſmall ſtead towards the Diſcovery of the Cauſes of the Diſtemper, and conſequently towards the Accompliſhment of its Cure: And if they will only grant us this Point, (as it is next to an Impoſſibility to deny it) this alone ought to be a ſufficient Motive to the Students and Practiſers of Phyſick, to apply themſelves to this moſt uſeful Study, and the main Streſs of all the Objections made againſt it by our Adverſaries falls to the Ground. But let us ſee in what Manner they pretend to prove their Aſſertion.

'The Brain, *(ſay they)* which is the conſtant Reſidence of the Soul, the more it has been handled and viewed by the Anatomiſts, the more its Uſe has been involv'd

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'in Obſcurity. All the Pains taken upon 'this Account by ſo many famous Men, all 'their Obſervations about its *Cortex*, *Me-* 'dulla, and the Combination of the Nerves, 'have not been able to give us the leaſt 'Light. And hence it is, that the *Apo-* 'plexy, *Epilepſy*, *Catalepſy*, *Vertigo's*, and the 'ſoporoſe Affection, as well as all the others 'depending on the Brain, are not cured 'with any better Succeſs in our Days, than 'they were in former Ages; for we conti- 'nue ſtill in the Dark as much as ever.

To ſolve this Objection, it is to be obſerved, That though it cannot be denied but that there are certain Uſes attributed to the Brain, that are founded only upon Probabilities: They are nevertheleſs for that Reaſon not involved in ſuch impenetrable Obſcurities as theſe Gentlemen would fain perſwade the World they are. And there are beſides this, divers other Uſes belonging to the *Cerebrum*, which are very manifeſt.

Thus it is evident, That the Glandules, of which the *Cortex* does conſiſt, do inceſſantly ſeparate a certain Juice, which is firſt intruded into its Fibres, and afterward into the Nerves, as their proper Excretory Veſſels. They are ſubject to Diſtempers in the ſame Manner as other Glandules are: For if this Separation be either diſturbed or quite aboliſhed, and conſequently this Juice cannot be communicated to the Excretory Veſſels, and the Blood ſupported in its due Circulation, from thence, and ſuch like Cauſes, will ariſe Apoplexies, Vertigo's, and other Diſtempers of the ſame Nature. This Propoſition is proved *a priori* from the Theory of the Separation of the Glandules, and *a poſteriori* from the Anatomical Obſervations of Abſceſſes, Coagulations, Extravaſations of the Blood and the *Lympha*, *&c.* Whence it is, that our Phyſicians have with good Reaſon relinquiſh'd the old Theory of the Generation of the Animal Spirits in the Ventricles of the Brain.

'Tis true, our internal Senſes, as the Memory, and ſuch like, ſeem to be ſuch Things, as in a great meaſure ſurpaſs our weak Apprehenſion; yet not to ſuch a Degree, as to leave us no Hopes of attaining to ſome Inſight into theſe Secrets of Nature, by a continued Application, and ſedulous Scrutiny; eſpecially if we call to our Aid what has been diſcovered of late Years by the Aſſiduity of our Anatomiſts, concerning the mechanical Structure of the Brain.

For it being beyond all Diſpute, that the Frame of the *Cerebrum* is a Compoſition of *Funiculi*, or *Tubuli*, that are hollow within, through which flows without Intermiſſion a certain Juice, according to the Quantity of which, they are either leſs or more diſtended or relaxed. When they are in a State of their Diſtention, they muſt be conſidered like ſo many Strings on a Muſical Inſtrument; and conſequently the leaſt Motion in the external Organs, (which are the Extremities of the Nerves) occaſioned by the Agitation of the Light in the Eye, by the Air in the Ears, by the ſaline Particles upon the Tongue, by ſolid Bodies on the Skin, and by the internal Liquids in the Origin of the Nerves, occaſions a tremulous Motion alſo in the Nerves, and ſucceſſively at their Extremities, where they are diſtended: And this is the Phyſical Motion of the Internal Senſes.

Now let us examine alſo, Whether Apoplexies are cured better now-a-days than in former Ages? Thoſe that will be at the Pains to conſider, without Prejudice, the Method uſed in the Cures of theſe Diſtempers, by our modern Phyſicians, founded upon the *Hypotheſes* and Diſcoveries of our modern Anatomiſts, and will make a due pariſon betwixt theirs and the Method uſed by the Ancients in the ſame Diſeaſe, will be fully convinced, that the Method of the modern Phyſicians is more rational, more ſafe, and much leſs troubleſom to the Patient.

For, as they ſuppoſed the Apoplexy to be cauſed by a pituitous Humour gathered in the Ventricles of the Brain, they uſed to preſcribe the Patient ſtrong Purgatives, ſuch as the Pills of *Scammony*, *&c.* which purging and evacuating the aqueous Humours, ſerved only to render the Blood leſs fluid. They uſed to apply alſo ſtrong Veſicatories, and actual Cauteries; for a red-hot Frying-pan was held and kept ſo cloſe to the poor Patient's Head, till it burnt the Hairs. Beſides which, they ordered them alſo Decoctions, Bathing, and ſuch-like Things. Our modern Phyſicians, in Apoplexies which are not conſummated, order Veneſection, in

order to reſtore or promote the Circulation of the Blood. Then they preſcribe ſuch ſpirituous Remedies, as are apt to produce a Volatility and quicker Motion in the ſanguineous Maſs, ſuch as will render it more fluid, and encreaſe the Quantity of the nervous Juice. Theſe are moſt commonly Alcali's, and Volatils in a moderate Degree, taken moſt commonly from Animals or Vegitables, and exhibited in ſome liquid Vehicle.

This Method is doubtleſs much ſafer, and not near ſo troubleſome to the Patient; and being founded upon ſuch Indications as have been plainly proved *a priori*, it is conſequently much more rational.

I judge I need not enlarge any further upon this Subject, it being obvious both from what hath been ſaid already, and from daily Experience, how far the modern Practice of Phyſick, founded upon the late moſt unqueſtionable and moſt uſeful Diſcoveries in Anatomy is preferable to the Theory as well as the *Methodus medendi* of the Ancients; which was for the moſt Part founded upon bare Notions and Conceptions, or entangled in ſuch obſcure Terms, as could neither be explained nor underſtood by any judicious Perſon; whereas it is evident, that our modern Phyſicians have not only reformed, but alſo quite altered in a great many Points, the ancient Practice of Phyſick: For, being guided by the late Diſcoveries in Anatomy, they have reduced the Diſeaſes into certain Claſſes, and ſettled both their Generation and Cauſes upon the true Baſis of the Animal Oeconomy, cloſely following the Tract of the Aliments from the Stomach, till it is turned into Chyle, and after that into Blood. They explain the Separation of the Blood, as it paſſes through the *Viſcera*, the Secretion of the Bile, of the nervous Juice, and of the other fluid Humours, from the Maſs of Blood, and their morbifick Alterations in this Animal Oeconomy; by which Means they are furniſhed, *a priori*, with ſuch Indications, as lead them into the right Paths of providing proper Remedies, as well *a priori*, as *a poſteriori*, for the Cures of thoſe Diſeaſes. Now if we conſider what vaſt Diſcoveries have been made by our modern Anatomiſts, in relation to the Structure of the Heart, and its Uſe for the Circulation of the Blood; the Motion of the Arteries; the Uſes of the Veins; the Exiſtency of the Lymphatick Veſſels; the Liquor they contain; their Propagation and Termination; the Lacteal Veins, and their Progreſs; the Structure of the Liver, together with its Uſes, and the Separation of the Bile; the Structure and Uſes of the *Parotides*; the Exiſtency and Structure of the Glandules of the Palate, and the *Trachæa*; the Structure of the Brain, which ſeparates that liquid Matter that paſſes into the Nerves; the Structure of the Kidneys, with the ſuccenturiate Glandules; the Structure of the Glandules of the Stomach; the Structure and Uſes of the conglomerated Glandules; the Way by which Sweat and Perſpiration is excerned; the Generation of Eggs; the Obſervations concerning Reſpiration in all Living Creatures; the Structure of the Lungs; the Structure and Uſes of the Bones, and their Medullary Oil; the Structure and Uſes of the Cartilages; the Structure and Uſes of the Ligaments; the Structure and Uſes of the mucilaginous Glands between the Muſcles and Interſtices, or Joints of the articulated Bones, *&c.* I ſay, if we conſider all theſe late Diſcoveries in Anatomy, and the Improvements that have been made in the modern Practice of Phyſick; from theſe, as well as from thoſe before-mentioned, and many more not mentioned here, Who would be ſo far beyond himſelf, as ſtill to inſiſt upon thoſe Trifles ſo much extoll'd by the ancient Phyſicians, which have ſcarce any Foundation elſewhere than in their own Brains?

As for Inſtance: Since the Liver has been ſo deſervedly deprived of her Function of Sanguification, Who is ſo ignorant as not to underſtand, that the Cauſe of the *Fluxus Hepaticus* muſt be look'd for ſome where elſe than in the Liver; and that conſequently the *Balnea* of the Ancients in this Caſe, and their external Applications to the ſuppoſed affected Part, are juſtly exploded by our Phyſicians? Would not any one that ſhould tell us at this Time a long Story of the exceſſive Heat of the Liver, which attracts (by Sympathy, forſooth) the natural Heat of the Stomach, refrigerates it, and thus rendring it unfit for Digeſtion, this proves the Occaſion not only of Crudities

there,

there, but alſo makes the Vapours aſcend to the Head, which produce Vertigo's, and other ſuch-like Diſtempers in that Part. Would not any one (ſay I) expoſe himſelf to the Laughter and Scorn even of our Apothecaries and Chirurgeons Apprentices? And yet theſe are the Things, with many more of the ſame Nature, which paſs'd for current many Ages together, for want of thoſe Diſcoveries that have been made ſince, which the Zealots for Antiquity would, notwithſtanding all this, repreſent to the World, either as Uſeleſs, or at leaſt as Superfluous to a Phyſician, conſidered in the Quality of a Phyſician; for after all, they can't deny but that theſe Diſcoveries are of ſingular Benefit to the improvement of Natural Philoſophy; which is implicitely, and in effect, owning its Uſe alſo in the Art of Phyſick, this being built upon Natural Philoſophy, and employ'd about the Natural as well as the Preternatural State of the human Body.

But we have perhaps dwelt too long upon a Subject, which by the almoſt Univerſal Conſent of all that have a true Inſight to the Art of Phyſick, as well as by daily Experience, ſeems to be eſtabliſh'd upon ſo ſolid a Foundation, that all the Objections raiſed againſt it by its Adverſaries (be they never ſo ſpecious) will never be able to ſhake it.

Nevertheleſs, as the chief Deſign of the following Book is to render the Study, as well as the Practice of Phyſick, as eaſie and as uſeful as poſſibly could be; and that according to the beſt Diſcoveries made both in Anatomy and Phyſick, about theſe fifty Years laſt paſt, I judged I could not poſſibly paſs by in ſilence thoſe Objections ſtarted againſt them by ſome, either to cover their own Ignorance, or elſe to acquire the ſpecious Title of being Zealots for, and Champions of Antiquity; leſt, if they had not been anſwer'd in the very Preface to this Work, the young Students in Phyſick might have been miſled from the right Path, and been induced, by theſe ſpecious Pretences, to loſe the Subſtance, whilſt they were graſping at the Shadow.

Not that I would have the Ancient Anatomiſts and their Labours deſpiſed as Frivolous and Uſeleſs; not in the leaſt: I am ſo far from it, that I think the learned World to ſtand highly indebted to the Induſtry and Lucubrations of the moſt celebrated Anatomiſts in former Times, as *Veſalius*, *Fallopius Aquapendens*, *Euſtachius*, *Bauhinus*, *Laurentius*, *Riolan*, *Bartholin* the Grandfather (not to mention *Galen* and others among the Ancients) and other noted Anatomiſts of their Time, for having ſhewn us the Way, and open'd to us the Door which has given us Admittance into the more abſtruſe Receſſes of the Microcoſm: But, after all, to confine our Study and Knowledge to theirs, and to neglect ſuch moſt uſeful Diſcoveries and Obſervations as have been made of late Years, both in Anatomy and Phyſick, would amount to no leſs than an inſupportable Stupidity or Infatuation.

We told you before, that the main Deſign of this Treatiſe was to make both the Study and Practice of Phyſick as uſeful, and as eaſie as poſſible could be; and 'tis upon this Score that we have undertaken to oblige the Publick with a *Bibliotheca Anatomica, Medica, Chirurgica*, &c. containing all that is moſt uſeful in thoſe moſt valuable Pieces that have been publiſh'd for above theſe forty or fifty Years, by the moſt celebrated Authors of our Age in their reſpective Profeſſions. But Anatomy being, as we told you at the very beginning of this Preface, one of the main Foundation Pillars of Phyſick, but at the ſame time involved in no ſmall Difficulties, 'twas next to an Impoſſibility to give our Reader a true and exact Syſtem of it, without having Recourſe to all thoſe noted Anatomiſts of our Time, that have applied themſelves to the Scrutiny of ſome peculiar Part of the Microcoſm, in order to diſcover its Structure and Uſes with the utmoſt Exactneſs.

For the World having been convinc'd by reiterated Experience, that thoſe who have attempted to write entire Anatomical Syſtems at once, have fallen far ſhort of their Intentions, that moſt ſtupendious Variety there is in the incomparable Fabrick of the Microcoſm being ſuch, as to be paſt the Diſcovery and Management of the moſt dextrous and moſt skilful Architect on Earth. The learned World, I ſay, having been ſufficiently convinc'd of this Truth, have pitch'd upon a more convenient Method of late Years, in order to diſcover the Excel-

lencies of this inimitable Structure, by ſharing this great Task between them, which has produced this happy Effect, That within the ſpace of forty or fifty Years laſt paſt, there have been more Diſcoveries made in Anatomy, than all the preceding Ages could pretend to.

Thus *Gliſſon* has undertaken for his Share the containing Parts of the *Abdomen*, the Stomach, the Inteſtines, and the Liver. *Wharton*, the Glandules of the *Meſenterium*, as alſo the Doctrine of the Glands in general. *Willis*, the Anatomy of the Brain, the Doctrine of the Nerves, and ſome other Parts. *Lower* and *Harvey*, the Heart; and the laſt of theſe two alſo, the Generation of Animals. The great *Malpighi*, the Liver, the Spleen, the Kidneys, beſides ſome other Parts. *Briggs* the Eyes. *Havers*, the Bones. *Kerkering*, the Generation of the Bones in the *Fœtus*; and *Eyſſon*, in new-born Infants. *Mayow*, the Muſcles. *De Graaf*, the Pancreatick Juice, and the Organs of Generation: With many more who have apply'd their Study and Labour to ſome peculiar Parts, too numerous to be mention'd in a Preface, but which will all be inſerted in the following Work. In this we intend to have Recourſe alſo to ſome of the general Anatomies, whenever there ſhall be Occaſion. For tho' there is not any one Part of Man's Body but what has been particularly treated of; yet wherever it was judged requiſite to add ſome Things that were not ſo fully explain'd in the particular Tracts, we have ſupply'd it out of ſome of the general Anatomies that have been publiſh'd, moſt of them lately, both at Home and Abroad. As for Inſtance; In the Bones, their External Structure, Figure, Conjunction, Articulations, Uſes, *&c.* being not deſcribed in any particular Anatomical Piece, except by *le Clerk*, we have in thoſe Points had Recourſe to Monſieur *St. Hilaire*, *Dion*, *Spigelius*, and others; for *Kerkering*'s *Oſteology*, relates only to the *Fœtus*, *Eyſſon* to young Infants, and our Dr. *Havers* has confined his *Oſteologia Nova* to a Philoſophical Enquiry into the Internal Structure of the *Perioſteum*, Subſtance of the Bones, their Marrow, Glands, Nutrition, *&c.*

Some of theſe Modern general Anatomies being diſpoſed in a very regular and exact Method, afford us another very remarkable Uſe; to wit, to give the Reader a ſuccinct Scheme in General of what is to be treated of afterward in Particular: And ſome of them may likewiſe at the Concluſion of the Deſcription of ſome of the moſt conſiderable Parts, as for Inſtance, of the *Thorax*, the *Abdomen*, *&c.* ſerve inſtead of ſhort Recapitulations of what has been explain'd more at large before.

To make the Whole the more compleat, and as uſeful as poſſible could be, we have not confined this Book to Anatomy only, but added to it all the moſt curious, moſt uſeful, and moſt approv'd Obſervations relating to moſt Diſtempers, and their Cures; ſuch as have been made by all the moſt celebrated Phyſicians, as well as Chirurgeons of our Time, and been publiſh'd both here and abrord: All which, as it will highly conduce to the Improvement of the Theory and Knowledge, as well of the Diſeaſes and their Cauſes (according to the more Modern Principles and Obſervations) as to the Practice of Phyſick and Chirurgery; ſo it will doubtleſs prove the moſt effectual Means to ſtop the Mouths, and check the Clamours made by our Adverſaries againſt the Uſefulneſs of our Modern Anatomical Diſcoveries, and convince the World of the Nullity of their Objections and Aſſertions.

That nothing might be wanting to attain to this Univerſal Improvement in any Thing that has a Relation to Phyſick, we have taken effectual Care alſo to join all the moſt approv'd and moſt uſeful Chymical Remedies, with thoſe that are commonly call'd *Galenical*; and as the firſt have this Advantage, That they are given with leſs Trouble and better Succeſs (in many Caſes) to the Patient, than moſt of the fulſome Potions, and unaccountable large Compoſitions of the Ancients; ſo, by the *Analyſis* and Trial they have undergone in the Fire, they being not ſo ſubject to alterations in the Stomach, (eſpecially if taken from the Minerals) they ſeem to be beſt adapted to the Modern Principles, as well of Natural Philoſophy as of Phyſick, which are founded chiefly upon the Laws of Motion and Mechaniſm: And this is, doubtleſs, the Reaſon why Chymical Preparations have made greater Advances in the World for theſe

Twenty

Twenty Years laſt paſt, than they did in above Two hundred Years before.

Concerning the Order and Method of the following *Bibliotheca*, we have taken Monſieur *de St. Hilaire*'s Anatomy, for the moſt part, for our Guide, being that which ſuits beſt with our Intentions; for it treats, firſt of the Parts, and next of the ſeveral Diſtempers, and their Cures.

We have accordingly made our Beginning with the Oſteology, or the Doctrine of the Bones; in which we have followed the Footſteps of this moſt ingenious Anatomiſt, as well as of ſeveral other noted Authors; and even of *Galen* himſelf, who adviſes his Diſciples to begin with the Anatomy of the Arms and Legs, with the Muſcles, Arteries, Veins and Nerves, before they proceed to inveſtigate the Structure of the Brain, Heart, Stomach, Lungs, Womb, *&c.*

Relying therefore upon the Authority and Example of ſeveral of the greateſt Anatomiſts, we have allotted the firſt Place in our *Bibliotheca* to the Bones; the next, to the Muſcles; the third, to the Nerves, Membranes, Fibres in general, and to the Arteries and Veins; the Fourth, Fifth, and Sixth, to the Three great Concavities of our Body, to wit, the Head, the *Thorax*, and the *Abdomen*; and the Laſt, is a general Syſtem of the whole Animal *Oeconomy*. All which has been treated in ſuch a Manner, as to place the Theoretical as well as Practical Part of each Diſtemper immediately after the Anatomical Deſcription of each Part; ſo that the Reader may at once have an exact and full View of every Thing that does relate to it, for his Inſtruction: For which Reaſon it is alſo, that no Labour nor Coſt has been ſpared to collect the beſt Cuts that could be had, and to have them engraven with more Exactneſs than ever was done as yet in any Piece of this Kind.

The ſame Care has been taken to make this our *Bibliotheca Anatomica*, *Medica*, *Chirurgica*, *&c.* to conſiſt of a Collection of all that is moſt curious, moſt valuable, and moſt uſeful, in all the modern moſt celebrated and moſt uſeful Pieces of Anatomy, Phyſick, and Chirurgery, publiſhed in all the moſt known Languages of *Europe*; which Collection containing above twice the Number that is extant in the Second *Latin* Edition of the *Bibliotheca Anatomica*, publiſhed in Two large Volumes in *Folio* at *Geneva*, by *Daniel Clericus* and *Jacob Mangetus*, M. M. D. D. has been gathered, with incredible Labour and vaſt Charges, out of the beſt Libraries, as well of theſe Kingdoms, as in Foreign Parts: So that in this Reſpect, we have followed the Pattern of that famous *Grecian* Painter, who when he was to draw the Pourtraiture of *Helen*, he made and gathered the Features in his Picture from all the moſt celebrated Beauties of his Time, in order to frame out of them all, one entire accompliſh'd Piece.

A Collection of this Nature, digeſted in its moſt natural Order and Method, will doubtleſs be of ſingular Benefit and Uſe, not only to young Students in Phyſick, but alſo to others who have made ſome conſiderable Advances in this great and noble Art; which being of ſo vaſt an Extent, they will here, in a Work of a moderate Bulk, have not only a full View of all that ſeems to be abſolutely neceſſary to their Profeſſion, but alſo a fair Opportunity of recollecting ſuch Things as may have eſcaped their Memories in ſo great a Variety of Matter, and that at an eaſie Rate, or without any exceſſive Expences.

'Tis beyond all Diſpute, That one Half only of thoſe Books that have been either inſerted, or elſe made uſe of in this Collection, would amount to ſuch a Sum, as few will be willing, and yet fewer will be able, to beſtow upon them; and even thoſe that are both willing and able, will perhaps never, or at leaſt not under a very conſiderable Time, meet with an Opportunity of providing themſelves with all theſe Books and Tracts, many of which are very ſcarce, and rarely to be ſeen here.

That this was the Senſe of the great and famous *Malpighi*, is evident from a certain Paſſage out of a Letter of his, written to the Editors of the before-mentioned *Bibliotheca Anatomica*; wherein he tells them, 'That though perhaps it might be poſſible 'for a private Man to collect all the Tracts 'and Pieces (in Anatomy) in Proceſs of 'Time, yet an entire Collection of this Na- 'ture would be of great Advantage to the 'Publick, and be a Means to tranſmit them

'with

" with leſs Trouble and Danger to Poſterity." And the famous Dr. *Ruyſh*, in his Letter to Dr. *Drelincourt*, ſays, 'That it would be a 'very acceptable Piece of Service to the Pub-'lick, to comprehend all the modern Ana-'tomiſts in one Work:" For (adds he) *I had provided my ſelf with moſt of them, but ſome being loſt, 'tis next to an Impoſſibility for me to purchaſe them again, they being ſo very ſcarce.*

I have no more to add at this Time, but that as in our following *Bibliotheca Anatomica, Medica, & Chirurgica*, we have had a due Regard both to the Uſefulneſs and Eaſe of all Perſons belonging to the Faculty, by furniſhing them with every Thing that is of Moment, not only in Anatomy, but alſo in Phyſick and Chirurgery; ſo we hope, that ſo great and uſeful an Undertaking will meet with the Approbation and Encouragement of the judicious Reader.

The

Fig. I

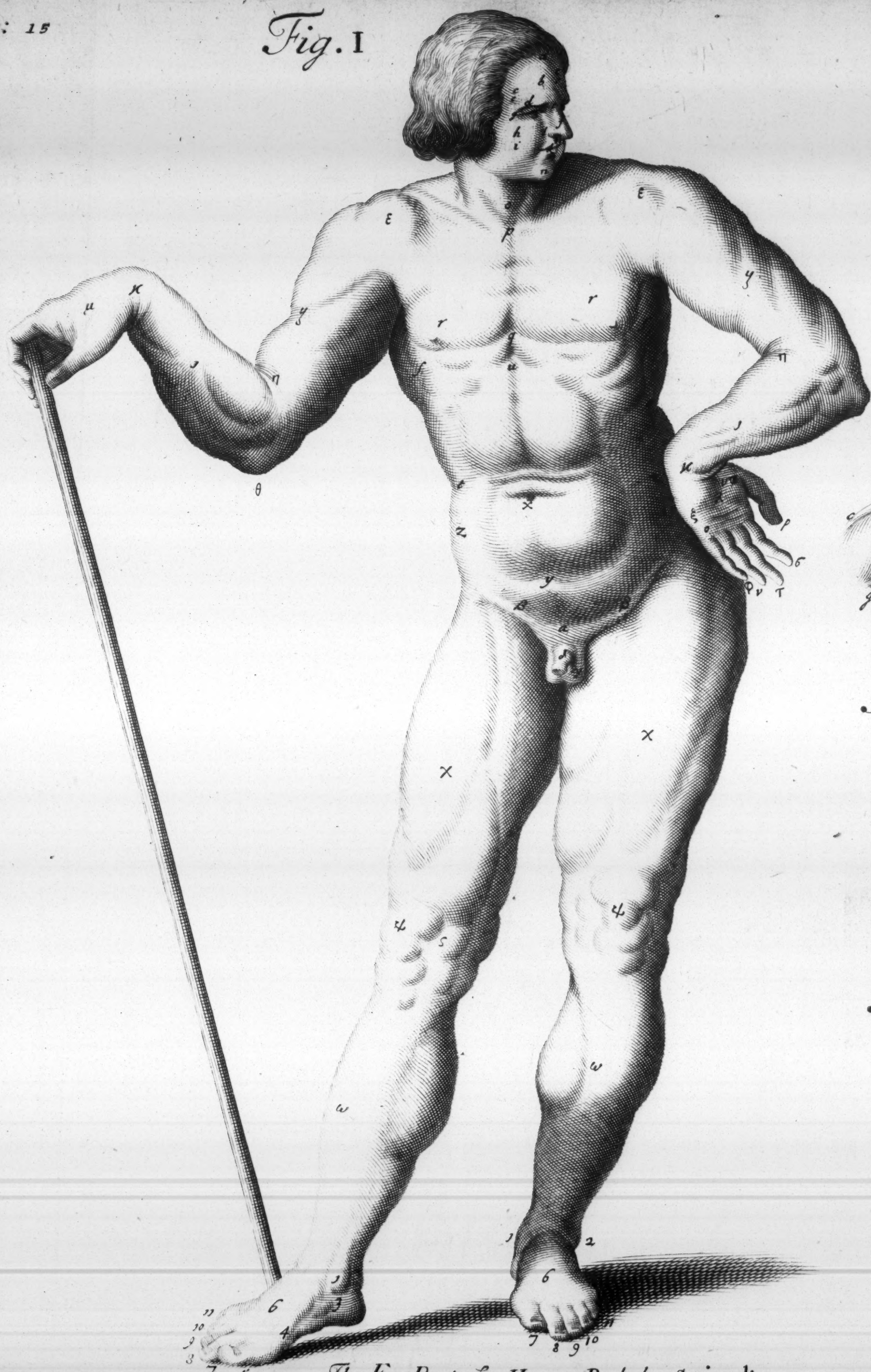


Fig. III

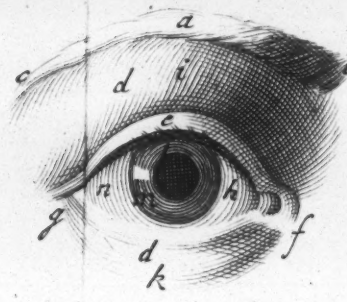
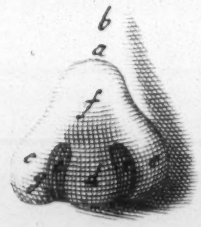


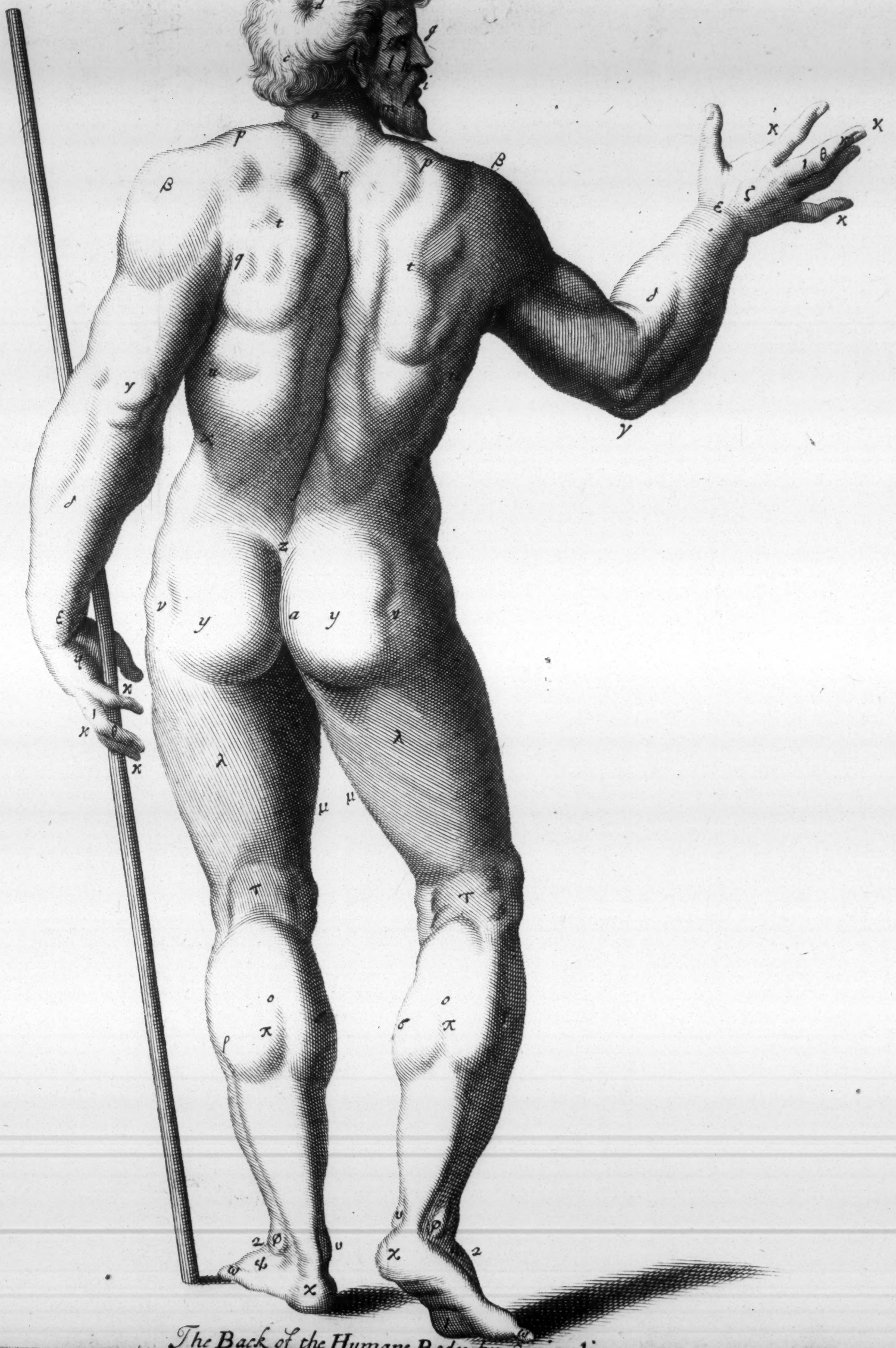
Fig. IV

Fig. V



The Fore Part of a Humane Bodyby Spigelius

Fig. II



III

IV

V

The Back of the Humane Body by Spigelius

The Explanation of FIGURE I. *repreſenting the Fore Part of a Humane Body; taken from* Spigelius's *Fabrick of the Humane Body, Printed by* Bleau, *in Folio, at* Amſterdam.

n. The Face.

b. The Forehead, or Front.

c. The Wrinkles on the Forehead, or Front.

d. The Eyebrows.

e. The *Glabella*, or Interſtice of the Eyebrows.

f. The Noſe.

g. The Eye.

h. The ſuperior *Maxilla*, or the Cheek.

i. *Bucca*, or the lower Part of the Cheek.

k. The Lips.

l, l. Myſtax, or Muſtache.

m. *Philtrum.*

n. The inferior *Maxilla*, or the Chin.

o. The Neck.

p. The *Jugulum.*

q. The *Scrobiculus Cordis*, or the Mouth of the Stomach.

q, r, ſ. The anterior Part of the *Thorax*, or the Breaſt.

q. The *Sternum.*

r. The Breaſts, in the Center whereof are the Nipples, which are ſurrounded by the *Areola.*

ſ. The Sides.

u, z, a. The inferior *Venter*, call'd improperly the *Abdomen.*

t. The *Hypochondria.*

u. The *Epigaſtrium.*

x. The Navel, and Umbilical Region.

y. *Sumen*, or the *Abdomen*, properly ſo called.

Z, Z. The *Ilia.*

a. The *Pubes.*

β, β. The *Inguina*, or Groins, in Greek Βουβῶνες, whence the Glandules that are ſeated there, and their Inflammations, are call'd by the Latins *Bubones*, or Bubo's.

γ. The *Scrotum*, or *Burſa Virilis*, the manly Bag or Purſe.

δ. *Penis*, or *Mentula*, the manly Yard.

ε, τ. The Hand, or the Arm.

ε. The *Humerus.*

ζ. The Place where we commonly cut Iſſues in the Arm, being betwixt the *Deltoides* or the Muſcles that lift up the Shoulder, and the *Biceps* or the firſt Flexor of the Cubit or Elbow; which are here delineated, with their carneous Prominencies in both the Arms. At the ſame Place the *Cephalick* Vein has its Paſſage.

η. The Flexure of the Cubit or Elbow.

θ. The Protuberancy of the Cubit.

ι. The *Cubitus*, or Elbow.

κ, τ. The Hand, properly ſo called.

κ. The *Carpus*, or the Wriſt.

λ, ο, ξ. The *Metacarpus.*

λ. The *Vola*, or Cavity of the Hand.

μ. The Back of the Hand.

ν, ξ, ο. The Lines of the Hand; *ν* the Line of Life; *ξ* that of the Head; and *ο* the Table-Line.

π. The Hillock of *Venus.*

ρ, σ, τ, υ, φ. The five Fingers; *ρ* the Thumb; *σ* the *Index*; *τ* the Middle Finger; *υ* the Annular; and *φ* the Little Finger.

χ. The *Femur*, or the Thigh; in the Fore and Middle Part whereof, where the Character is placed, Cupping-Glaſſes are applied to promote the Menſtrual Courſes.

ς. The Place where Iſſues are made in the interior Part of the Thigh, about three Fingers Breadth above the *Patella*, betwixt the Muſcles call'd the *Extenſores* and *Flexores* of the *Tibia.*

ϟ. The Knee, with the Knee-Pan.

ω. The *Antiknemion*, or the anterior Part of the *Tibia.*

ι. The *Malleolus internus*, or inner Ankle; near which the *Saphæna* is opened in the Suppreſſion of the *Menſtrua.*

FIGURE

FIGURE II. *represents the Posterior Part of the Humane Body; from the same Author and Edition.*

a, b, c, d. The *Scalp*, or hairy Part of the Head.
a. The *Synciput* or *Bregma*, the Fore-part of the Head, or Fore-head.
b, b. The Temples.
c. The *Occiput.*
d. The *Vertex*, or Crown of the Head.
e, k. The smooth Part of the Head, or the Face.
e. The Forehead, or the Front.
f. The Eye.
g. The Nose.
h. Mystax, or Mustache.
i. The Mouth.
k. The Chin.
l. The Cheek.
m. The Beard.
n. The *Auricula*, or the External Ear.
o. The Neck.
p. The *Humerus.*
q. The Armpit.
r, s, t. The Posterior Part of the *Thorax*, or the Back.
r, s. The Spine.
t, t. The *Scapulæ*, or Shoulder-blades.
u, u. The Lateral Parts.
x, x. The Posterior Part of the lowermost Venter, the Loins.
y. The Buttocks.
Z, Z. The Cleft betwixt the Buttocks.
α. The *Podex*, or *Anus.*
β. The *Humerus.*
γ. The *Olecranum*, or the Protuberancy of the Cubit.
δ. The Cubit, or Elbow.
ε, ". The Hand properly so call'd.
ε. The *Carpus*, or Wrist.
ζ. The *Metacarpus.*
η. The Fingers.
θ, ι, κ. The *Phalankes*, or Internodes of the Fingers.
θ. The *Condulus.*
ι. The *Metacondylus.*
κ. The *Procondulus.*
λ. The Posterior Part of the *Femur*, or of the Thigh.
μ. The Interior Part of the *Femur.*
ν. The *Coxendix:* Unto this Part are apply'd the Remedies against the Istriatick Pains.
ξ. The *Perinæum*; being the Place where the Lythotomists make their Incisions to take out the Stone of the Bladder.
ο. The *Sura*, or Calf of the Leg.
π. The Place where Issues are made with good Success against the Istriatick Pains.
ρ. The *Paracnemium.*
σ. The *Procnemium.*
τ, τ. The Inner or Concave Part of the Knee, where passes the *Vena Poplitea* into the Leg.
υ. The Outward *Malleolus*, or Ankle.
φ. The Interior *Malleolus*, or Ankle.
χ. The *Calcaneus.* The *Tarsus.*
ψ. The *Metatarsus.*
ω. The Toes.
1. The Sole of the Foot.
2. The Instep.

FIGURE III. *represents all the External Parts of the Eye; from the same Author and Edition.*

a. The Eyebrows.
b. The Head of the Eyebrows.
c. The Tail of the Eyebrows.
d, d. The Eyelids.
e. The Hairs of the Eyelids.
f. The great Corner of the Eyes.
g. The lesser Corner of the Eyes.
h. The *Foramen Lacrymale.*
i. The Cavity of the Eye.
k. The Subcavity of the Eye.
l. The *Pupilla*, or the Sight.
m. The *Iris.*
n. The White of the Eye.

FIGURE IV. *repreſents the External Ear, and its Parts; from the ſame Author and Edition.*

a, b. The *Auricula*, or the External Ear.
a. The Superior Part, or the Wing of the *Auricula.*
b. The Inferior Part, or the Lobe of the *Auricula.*
c. The *Helix.*
d. The *Anti-Helix.*
e. The *Concha.*
f. The *Hircus*, or *Tragus.*
g. The *Anti-Tragus.*
h. The *Meatus Auditorius.*

FIGURE V. *repreſents the Noſe, and its Parts; from the ſame Author and Edition.*

a. The Spine, or Ridge of the Noſe.
b. The *Colatorium.*
c, c. The Noſtrils.
d. The Column.
e. The *Alæ*, or Wings of the Noſe, the *Pinnæ* of the Noſtrils.
f. The *Globulus*, or Tip of the Noſe.
g. The Hairs within the Noſtrils.

A Short

ACCOUNT

OF THE

Denominations, Figure, Magnitude and Mutual Proportion of the External Parts.

BEING

The First Book of a Voluminous Piece, Entituled, *The Fabrick of the Human Body.* Written Originally in *Latin*, by *Adrian Spigelius*, a Native of *Brussels*, Knight of St. *Mark*, and Professor of *Anatomy* and *Chirurgery* at *Padua*.

CHAP. I.

A short Explanation of the Names of the External Parts of the Head.

ACCORDING to *Galen*, we will divide first of all the Human Body into its several *Venters*, and its *Extremities*, or the *Limbs*. A *Venter*, is call'd any remarkable Cavity of the Body that contains some of the principal *Viscera*; but the *Limbs* are those Parts, that like Branches spring forth from, and are united to the Trunk of the Body: Such are the *Hands* and the *Feet*. There are three *Venters*; to wit, the first and superior, which is the *Head*; the middle Part, which is the *Thorax*; and the lowermost, the *Abdomen*, improperly so call'd.

The *Head* therefore is the first *Venter*, by which I understand in a large and yet proper Signification, all that Part that rests upon the first *Vertebra* of the Neck; for in a strict Sense, Physicians oftentimes call the *Brain* also the *Head*; and sometimes also in a more strict Signification, take only that Part which is cover'd with Hairs for the

Head.

Head. So does *Hippocrates* in his Book, unto which he has given the Title of the *Wounds of the Head*; and ſo do moſt of our Modern Chirurgeons, when they make a diſtinction betwixt the Wound of the *Head* and thoſe of the *Face.*

The Head is divided into two Parts; to wit, into that which is *hairy*, and that which is *ſmooth*, or without Hairs. The firſt Part is call'd the *Cranium*, the *Calvaria*, or Skull; which is ſubdivided into four Parts, *viz.* into the *Anterior*, the *Poſterior*, and two *lateral* Parts, in the middle of which is placed the *Vertex*, or the Crown of the Head, as in the Center, from which proceeds this Partition. For, that Part which proceeds from the *Vertex*, or the Crown of the Head forward, and to the *Front*, is called the *Synciput*, or Fore-part of the Head; but that which is oppoſite to this, and reaches from the *Vertex* to the Neck, is the *Occiput* or Hind-Head; but the two lateral Parts, to wit, from the *Vertex* on both Sides down to the *Ears*, are call'd the *Tempora*, or, as ſome will have it, the *Timpora*, the Temples. Of theſe, there are Two, which are plac'd on the Sides of the *Synciput*, betwixt the Eyes and the Ears, where the Head is ſomewhat flatter. The Hairs grow round about the *Vertex*, like a Circle. Some Perſons are obſerv'd to have a double Crown, whence they are call'd *Bivertices:* Theſe Hairs which cover the Skull are more properly call'd *Capilli*; i. e. *Capitis pili*, in which we may obſerve their Colour, Lankneſs, or Curlings; from thence ſome pretend to give their Judgment of the Conſtitution of the Body.

The ſmooth Part, or that which is without Hairs, is diſtinguiſh'd into the *Face*, and the *Ears.* The *Face* comprehends all that Part, which beginning at the *Synciput*, where the Hairs end, terminates at the *Chin.* It is ſubdivided into ſeveral Parts, *viz.* the Front or Forehead, the Noſe, the Eyes, the Cheeks, the Lips, the Mouth and the Chin; of each of which, we ſhall ſay ſomething in due Order. The Front or *Forehead* adjoyns at the ſuperior Part to the *Synciput*, and the inferior Part of it is limited by the Eyebrows, and the Interſtice that is betwixt them, and on both Sides, by the *Tempets.* The Skin of this Part is the only Thing that is moveable in Man; in which appear certain Lines, which when the Forehead is contracted or drawn together, are call'd *Wrinkles.* Theſe are the Object of the Phyſiognomiſts: They are Twofold; for ſome are extended in length, and others in breadth: Of the firſt, there are ſeven, each of which is dedicated to a peculiar Planet: But they are not all conſpicuous in all Perſons; there being moſt commonly ſome wanting. Thoſe that appear moſt, commonly are dedicated to *Mercury*, *Venus* and *Jupiter*; which are more conſpicuous, if you draw your Eyebrows upwards. On the inferior Part of the Front or *Forehead* are the Eyebrows, which, for that Reaſon, are ſtyl'd by *Ruffus*, the *hairy Extremities* of the Forehead. They conſiſt of Hairs extended lengthways upon the Confines of the Forehead and the Eyes, being deſign'd to receive the Sweat, and keep it from falling into them: They are call'd *Supercilia* by the *Latins*, from their Poſition, being plac'd above the Eyelids, which anciently were call'd *Cilia.* That Part which is neareſt to the Noſe, is call'd the *Head*; and that next to the Temples, the *Tail* of the Eyebrows. The Interſtice betwixt the Eyebrows is call'd in *Latin Glabella*, from its being deſtitute of Hairs, tho' ſometimes it is hairy, to wit, when both the Eye-brows meet at the Noſe.

Under this Interſtice begins the Noſe. It is diſtinguiſh'd into the *Superior Part*, which is oſſeous and immoveable; and into the *Inferior*, which is cartilaginous and moveable. Each of theſe is divided again into two lateral Parts; and betwixt theſe is the middle Part, which is ſharp or pointed, and call'd the *Spine* or *Dorſum*, or the *Ridge*; the uppermoſt Part of which is call'd the *Colatorium*, from its Uſe, becauſe the *Mucus* is percolated through it like as thro' a Sive; tho' this is not its proper natural Function, as ſhall be ſhewn hereafter: For the *Os Ethmoides* or *Spongioſum*, is rather deſign'd by Nature for the Benefit of Smelling, than for the Excretion of Excrements. The two Holes or Openings below, are call'd the *Nares* or Noſtrils, being diſtinguiſh'd in the middle by a cartilaginous Partition, call'd the *Column*; unto which is adjoin'd unto its ſuperior Part, the *Interſeptum Oſſeum*, or Oſſeous Partition. The inferior Parts

or Wings of the Noſe, which are moveable, are call'd by the *Latins* the *Alæ*, or *Pinnæ narium*; the rotund inferior Protuberancy of the Noſe, the *Orbiculus* or *Globulus* of the Noſe; but the Hairs that grow within the Cavity of the Noſtrils, are by the *Latins* call'd *Vibriſſi* and *Vibriſſæ*.

The *External Eye*, ſo called to diſtinguiſh it from the *Internal* (which does not belong to our preſent Purpoſe) is placed under the Eye-brows, and on the Side of the Root of the Noſe, and conſiſts of two Parts, *viz.* one which ſerves for an Integument to the *Internal Eye*; and the other, which in effect belongs to the *Internal Eye* itſelf; but becauſe it offers it ſelf to our Sight, without any Diſſection, ſeems to challenge a Share in this Account of the *External Eye*. The firſt is call'd the *Palpebra*, or Eye-lid; of theſe, there are two on each Eye; the uppermoſt of which covers the Eye from above, and the other cloſes it up from below. Theſe Eye-lids being deſigned for the Defence of the Eyes, eſpecially whilſt we are aſleep; if they don't cloſe at that time, ſo as that ſomething of the White does appear, it is judged by Phyſicians (eſpecially the Ancients) to be the forerunner of dangerous, if not mortal Feavers: Tho' ſometimes alſo this is occaſion'd by exceſſive Purgations, and *Diarrhœa's*, or elſe by ſome External Cauſes. Beſides, that it is natural to ſome People, not to cloſe their Eyes when they Sleep; and therefore we muſt not be too raſh in our Judgment. The Hairs that grow on their Extremities (the *Eye-laſhes*) are by ſome call'd *Cilia* in *Latin*, but erroneouſly.

The Semilunar Cartilages, that ſurround the Extremities of the Eye-lids, which are conſpicuous if you turn the Inſide outwards, and when the Eye-lids are ſhut are joyn'd both together, are call'd the *Crepidines* of the Eye-brows, as alſo *Cilia* by the Ancients. Theſe extending one over another at both Ends, form the Angles in both Corners of the Eyes; among which, that which is neareſt to the Noſe is call'd the *Greater*, and that which is neareſt to the Temples, is ſtyl'd the *Leſſer* Angle. *Heſychius* ſtyles the *greater Angle*, the *Spring*; becauſe the Tears ſpring and flow from thence. For here, at the End of the inferior Eye-lid, is a ſmall *Foramen* or Hole, but very deep; out of which flow the Tears. This Part if it be affected with ſharp Defluxions, by the Tears, or by ſome purulent Matter ariſing from an Inflammation of the adjacent Parts which is diſcharged that way, produces what is call'd by the Phyſicians, the *Fiſtula Lacrymalis*. Thoſe that are curious to have an exact and full View of this Hole, let them take a right View of the Eye of an Ox that is lately kill'd, and they will find it there both pretty large, and conſpicuous. 'Tis ſaid, that this Hole is bigger alſo in Women than in Men; as alſo in thoſe that are given to ſhed Tears, beyond what it is obſerved in thoſe that ſeldom or never ſhed any. Betwixt the boney Part and both the Eye-lids, are ſmall Cavities, almoſt of a Semicircular Figure; the uppermoſt of which is call'd the *Cavity of the Eye*, and the undermoſt the *Sub-Cavity*. Both theſe Cavities, but eſpecially the lowermoſt, are apt to ſwell in the Dropſie and *Cachexy*; eſpecially if they owe their Origin to an exceſſive and long continued Flux of the *Menſes*, or of the *Hemorrhoids*. The ſame Thing is obſervable alſo in thoſe that have been a long time without Sleep, and in the beginning of an *Ophthalmia*. In thoſe that are afflicted with an exceſſive Menſtrual Flux, this Tumor turns livid; and in thoſe that have the Venereal Diſeaſe, it appears very pale and ſhining, which I have always taken for a certain Sign of the *French* Diſeaſe.

Next to the Eye-lids, we muſt come to the *Organ of Seeing*, which is call'd the *Eye:* In the midſt of it you ſee a blackiſh Circle, but ſhining with a Luſtre like a Looking-glaſs; and in effect it performs the Functions of a Looking-glaſs here, by repreſenting the oppoſite Objects or Images of the *Sight*: It is call'd the *Pupilla*. This is ſurrounded by another, which exceeds the former in Bigneſs, but is inferior to it in its Luſtre, which from the Variety of its Colours, is call'd the *Iris*, i. e. the Rainbow; and it is obſervable, that Man is almoſt the only among all the Animals that can boaſt of having a Diverſity of Colours in the Eye, and that not only in reſpect of individual Perſons, but alſo of whole Nations. Thus the *Negro's* have it black; the *Netherlanders* moſt commonly grayiſh, as well as moſt of the Northern

thern Nations. The *Italians*, with their Neighbouring Nations, for the moſt part, *yellow*. The *White of the Eye*, is call'd that Part which is conſpicuous beyond theſe Parts, by its white Colour, and is form'd by the *Tunica Cornea*. The Bones that are juſt over the Eyes, or immediately below them, might very properly be call'd *Subocularia*.

Next to theſe we come to the *Cheek*, which is divided into the Superior and the Inferior. The Superior (which is call'd alſo the Upper Jaw) is form'd under the Eyes, betwixt the Noſe and the Ears, by two roundiſh Prominencies of the Face, which are peculiar to Man; they are call'd *Malæ* by the *Latins*. *Hippocrates* calls them the *Circles of the Face*. This Part of the Face is commonly very red in thoſe that are affected with the *Peripneumonia*, becauſe the Skin is very thin here, and without any Fat underneath it; which makes the Sanguineous Veſſels, when they are inflated by the Affluence of Blood, to be more conſpicuous here. The Inferior Part of the Cheeks which is not ſo firm, is call'd *Bucca* in *Latin*; here in ſome People, when they laugh, appears a Line, or Depth, or ſomething like a Wrinckle, call'd *Gelaſinum* by *Martial*.

Under the Noſe and the Cheeks are plac'd the two *Lips*, call'd *Labia*, as alſo *Labra* by *Cicero*, being deſign'd to cover the Mouth and the Teeth. Their Extremities are red, and the Aperture that is betwixt them when they open, is call'd *Os*, or the Mouth.

Within this Aperture of the Mouth, when the Lips are opened, there appears in the Circumference of each of the *Maxilla's*, or Jaws, the *Dentes* (*quaſi Edantes*) or the Teeth. Their Number does vary ſometimes, not in reference to the Sex, as *Ariſtotle* would have it, but in reſpect of individual Perſons, ſome having more, ſome leſs; but moſt commonly their whole Number is Thirty two, to wit, Sixteen in each Jawbone. Four of theſe are call'd the *Inciſores*, which are in the Middle; two are call'd *Canini*, one on each Side of the *Inciſores*, and five are call'd the *Molares* or *Grinders*, from their Function, which is to grind the Aliments in the Nature of a Mill. The Cavities, in which are contained the Teeth ſeparately from one another, are call'd the *Alveoli*, or Sockets of the Teeth; but the whole carneous Maſs, which encloſes the Teeth like a Fence, is call'd in *Latin Gingivæ*, or the Gums. Betwixt the Upper-Lip and the Noſe, is that Part where the Beard begins to appear firſt; which, when it grows ſtubborn, is call'd *Myſtax*, the *Muſtaches*. Under the Under-Lip, is the *Maxilla Inferior*, or what is call'd the *Mentum* or *Chin*, from *Eminendo*, it being raiſed above the *Gula*; it is the lowermoſt Part of the Face, which terminates in an acuminate Rotundity. The Hairs that firſt begin to come forth hereabouts in Adult Perſons, are call'd in *Latin Lanugo*, i. e. the *Down*; but when they grow more ſtubborn, it is called the *Barba*, or the *Beard*.

Next unto the Temples, are placed the *Ears*, which are the Organs of Hearing; tho' to ſpeak properly, the whole Organ of Hearing conſiſts both of the Internal and the External *Ear*; whereas it is the *External* only that at this Time falls under our Conſideration; to wit, that which is ſeated on the Outſide of both Sides of the Face, call'd by the *Latins Auricula*; its ſuperior Part is Cartilaginous, and is call'd *Pinna*, the Wing, by *Gaza*; and the inferior Part is call'd the *Lobe*, or the *Fibra*, by *Gaza*; and the Extremity or Circumference is call'd *Helix*, from its Tortuoſity; but the interior Semicircle, which is anſwerable to this, is ſtyl'd the *Anti-Helix*. The Cavity it ſelf, near which it is placed, is call'd the *Concha*, from its Reſemblance to a Muſcle, in its anfractuous Tortuoſity. Near it is a Prominency towards the Temples, call'd the *Tragus* or *Hircus*; becauſe hereabouts grow ſome thick Hairs, not unlike the Goats Beard; that Part which is oppoſite to it, is call'd the *Anti-Tragus*. The *Foramen* or Hole, in which gathered the Excrements, is call'd the *Meatus Auditorius* (and the Excrements by the Ancient *Latins*, *Cerumina*, the *Ear-wax*) perhaps from its Colour and Conſiſtency, it being like yellow Wax.

Under the Head you ſee a certain round and oblong Part, of the Figure of a Cylinder, extending downward to the Shoulders: It's placed betwixt the ſuperior and middle Region of the Body, but nevertheleſs ſeems to belong rather to the Head, than to the *Thorax*. It is call'd *Collum*, or *Cervix*, the

Neck.

Neck. Some are of Opinion, that the Word *Cervix* relates only to its Back Part; but by moſt Authors it is taken promiſcuouſly in both Senſes. It is divided into the Anterior, and Poſterior Part; in the Anterior, is plac'd the Head of the *Arteria aſpera*, which chiefly diſcovers its ſelf by its *Scutum*, call'd commonly the *Adam's Apple*, or the *Nodus Gutturalis*; but on its lowermoſt Part, where it is adjacent to the *Thorax*, there is a Cavity adjoyning to the Breaſt, with an acute Angle, call'd *Jugulum*; tho' *Homer*, as well as *Pliny* (*l.* 2. *Hiſt.*) have applied the Signification of this Word, not only to this Cavity, but alſo to thoſe two other Cavities which are on both Sides, juſt by the *Clavi-cula*, under the Extremity of the Neck, and at the upper End of the *Thorax*. For *Pliny* tells us expreſly, that a Man has two *Ingula*, to wit, the Right and the Left. The *back Part* of the *Neck* reaches from the *Occiput* down to the *Scapulæ*, and the Shoulders; for the *Humeri*, or Shoulders, are call'd thoſe Parts that are ſeated on both Sides of the Neck, and make the beginning of the whole Hand or Arm, being form'd by that Prominency which is made by the Conjunction of the Head of the *Os Humeri*, with the broad Bone of the *Scapulæ*. The concave Part that is oppoſite to this, under the Joint of the Arm, is call'd *Axilla*, or *Aia* by the *Latins*; in *Engliſh*, the Armpit.

CHAP. II.

Of the Denomination of the External Parts of the Thorax, *or the Cheſt.*

NEXT adjacent to the Neck, is the *middle Venter* or Region, being the Reſidence and Receptacle of the Heart, and the Parts deſign'd for the *vital Faculties*. This Part is call'd the *Thorax* by the *Latin* Phyſicians; tho' the Word θώραξ has an ambiguous Signification: For *Hippocrates*, *Ariſtotle* and *Plato*, comprehend under this Word, not only the *middle Venter*, but the whole Trunk of the Body alſo, conſiſting of the *middle* and *inferior Venter*, which begins at the Neck, and ends at the *Pudenda*; and therefore we need not be much ſurpriz'd, when we find ſometimes theſe Authors to have plac'd the *Liver* in the *Thorax*, which ſome of our Modern Anatomiſts have attributed (but too raſhly) to their Ignorance in Anatomy. But *Galen* has always taken the *Thorax* in a ſtrict and its proper Signification (in which he is follow'd by the Moderns) to wit, for that Part only, which being placed immediately under the Neck, is inclos'd on both Sides by the Ribs: And in the ſame Signification it has alſo been taken by *Ariſtotle* in ſome Places; as when he ſays (1 *Hiſt. Animal.* 13.) That the *Venter* or Belly is ſituated under the *Thorax* on its Fore-part, *&c.* It is diſtinguiſh'd into three Parts, the *Anterior*, the *Poſterior*, and *Lateral*. The *Anterior* Part begins at the Cavity of the Neck, near the *Claviculæ*, and reaching to the ſoft Parts, is call'd the *Pectus* or the *Breaſt*. The *middle Part* of the Breaſt, beginning at the *Jugulum*, and terminating at the *Cartilago Mucronata*, is call'd the *Sternum*; on both Sides of it are plac'd two round carneous Protuberancies, the Breaſts which are common to both Sexes, but larger in Women than in Men. The *Latins* call them *Mammillæ* in Men, and *Mammæ* in Women; and thoſe belonging to other Animals are call'd *Ubera*. The Body of the Breaſts, eſpecially when they are full of Milk, is call'd *Uter*; that ſmall round Prominency the *Papilla*, or the Niple; and that dark colour'd Part which ſurrounded it, is call'd *Areola* by the *Latins*.

The *Poſterior* Part, which is ſeated oppoſite to the Breaſt, beginning at the Neck, and reaching down to the End of the Ribs, to the Beginning of the Loins, is call'd the *Dorſum* or *Tergum*, the *Back*. It is ſubdivi-

ded

ded into two Parts, to wit, the *Scapulæ*, and the *Spina*. The *Scapulæ*, or *Shoulder-blades*, are call'd the two Superior Prominencies, arising from the broad Bone of the *Scapula*; but the *Spina* is call'd that acute Protuberancy which extends all along the whole Length of the Back, and divides it into the right and left Part.

The two *Lateral* Parts are plac'd betwixt the Anterior and the Posterior; they begin under the Armpits, and terminate with the Ribs; so that these *Latera*, or Sides, are distinguish'd into the *Right* and *Left*; but because the Interstices betwixt the Ribs, by which they are conjoin'd, consist of a carneous Substance, these Intervals may very properly be call'd the *Intercostal* Parts.

CHAP. III.

Of the Denomination of the External Parts of the Lower Venter.

THE Third *Venter* which contains the natural Parts design'd for Nutrition and Generation, and is seated on the lowermost Part of the Trunk of the Body, is of a soft and carneous Substance: It is inclos'd betwixt the *Cartilago Mucronata*, the two Sides, the Loins, and the *Ossa Pubis*. The *Latins* call it the *Venter*, or the Belly, in a strict Signification; to avoid which, *Celsus* has given it the Name of the *Imus Venter*, or the lowermost *Venter*, to distinguish it from the two superior *Venters*; to wit, that of the Head, and that of the *Thorax*. Some have call'd it the *Abdomen*, but in a very improper Signification.

It is distinguish'd into the *Anterior* and the *Posterior* Part. The first begins at the *Cartilago Ensiformis*, or *Mucronata*, and extends to the *Ossa Pubis*; the latter reaches from the lowest Ribs to the Extremity of the *Os Sacrum*. The *Anterior* Part is subdivided into three Parts; to wit, the *Superior*, the *Middle*, and *Lowermost*: The superior Part beginning at the *Cartilago Mucronata*, and the Extremities of the Ribs, terminates very near the Navel. The *middle* Part comprehends a Space of three or four Inches above and below the Navel, being call'd also the *Umbilical* Part, which is plac'd, as it were, in its Centre. The *lowermost* begins where this ends, and reaches down to the *Ossa Pubis*. Each of these Parts are distinguish'd again, by the Anatomists, into two Parts, to wit, the *Middle* and the *Lateral*, of which we will say something in Particular.

The *Latera* or Sides of the superior Regions, are call'd properly *Hypochondria*, i. e. *Subcartitaginea*, being placed under the Cartilages of the spurious Ribs. *Celsus* (l. 4. c. 8.) says, that they are call'd *Præcordia* by the *Latins*; but *Pliny* (l. 11. *Nat. Hist.* c. 37.) makes use of this Word for the *Diaphragma*. The middle Part, which lies betwixt the said *Latera*, is call'd in *Greek* the *Epigastrium*, i. e. *Superventrale*, in which there is a Cavity call'd by the Ancients καρδια, *i. e. Cor*, or the *Heart*: Whence it is, that the Pains that are felt in that Part, are call'd *Cardialgiæ*, i. e. Pains of the Heart. By some it is call'd *Præcordium*, or *Anticordium*; and by others, the *Os Ventriculi*, or the Mouth of the Stomach; because under it lies the upper Orifice of the Stomach; and 'tis for that Reason why we apply External Remedies for the Stomach to that Part.

The *Umbilical* Part, or Region (where is situated the Navel) is the Center of the whole Body, and of the *Abdomen*. That Part which is wrinkled about the Navel, is call'd *Vetula*; because it is wrinkled like an old Woman's Forehead. In Dogs, and other Animals, there are no Pleats or Wrinkles, but they have only a hard and smooth Knob or Node. This whole Umbilical Region is, in healthful People, rising a little

like

like a Hillock in the middle of the Belly, and is very conſpicuous in lean People after they are dead. It has no Lateral Parts; tho' *Laurentius* (l. 6. *Hiſt. Annat.* c. 2.) ſays it has, and has given them alſo their peculiar Names.

The *lowermoſt Region*, call'd by ſome the *Hypogaſtrium*, is ſubdivided into three Parts; to wit, the *middle Part*, by *Gaza* call'd *Sumen* and *Abdomen*. The Lateral Parts which extend to the *Hypochondria*, by the *Greeks* call'd λαγόνες; becauſe they are the Seat of Laſciviouſneſs. The *Latins* call them *Ilia*, becauſe under them lies the *Inteſtium Ilium*. Under the *middle Part* of the *Hypogaſtrium*, is ſeated the *Pubes*; which Word ſignifies not only the Hairs that grow on the *Pudenda*, and the Place where they grow, but alſo the Age of *Puberty*, being the fourteenth in Males, and the twelfth in Females. For ſo ſoon as there is a free Paſſage for the Seed and the *Menſes*, the Hairs begin to appear on the *Pubes* of both Sexes. Here are plac'd, both on the right and left Side, what the *Latins* call the *Inguina*, or the Groins.

It is requiſite we ſhould be the more attentive upon the Denominations of thoſe Parts, the more frequently we find them mention'd by *Phyſicians*; as well in applying proper Remedies to the *Belly*, as inveſtigating the Cauſes of their Diſeaſes. For the greateſt part of the *Liver* is plac'd in the right *Hypochondrium*, with part of the Stomach: In the left, is the whole *Spleen*; in the *middle Region*, a great part of the *Stomach*, tho' a good part of it is plac'd in the left *Hypochondrium* alſo. The whole *Inteſtinum Jejunum* is ſituated under the *Umbilical Region*. Under the *Ilia*, on both Sides the *Inteſtinum Ilium*; and on the right, ſome Parts of the *Colon*, *Ileon*, and *Cæcum*, which are conjoin'd; and on the left, a great part of the *Colon* and *Inteſtinum rectum*. Under the middle Part of the *Hypogaſtrium* lies the Bladder, the *Inteſtinum rectum*, and the *Womb* in Women.

The Poſterior Part of the *lowermoſt Venter*, contains the Loins, which have their Beginning at the hollow Part of the Back, and reaches to the Buttocks. Their Carneous Part on both Sides, is by the *Latins* called *Pulpa*; on the right Side, is ſeated the right Kidney; and on the left, the left Kidney. The other Carneous Parts, which are ſeated on both Sides under the Loins, adjoining to the *Oſſa Innominata*, are call'd by the *Latins* the *Clunes* or *Nates*, the Buttocks; which are very large and of a Carneous Subſtance, for the Conveniency of ſitting eaſie and firm, which ſeems to belong in a peculiar manner to Man. The *Fiſſura*, which diſtinguiſhes the two *Buttocks*, has a Hole, where is the Extremity of the *Inteſtinum rectum*, and gives a free Paſſage to the hard Excrements; it is call'd the *Podex*, or *Anus*.

CHAP. IV.

Of the Denominations of the External Parts dedicated to Generation.

THE Parts deſign'd for Generation, are by the *Latins* call'd *Pudenda* and *Naturalia*, the *Genital* or *Natural Parts*. They differ according to the Sex. The *Genital Parts* of *Men*, may properly be diſtinguiſh'd into two Parts; to wit, that which enters the *Matrix*; and that which remains outward, and hangs down like a Pouch or Purſe; whence it is call'd *Scrotum*, or *Scortum*, by the *Latins*; to wit, from its Reſemblance to a Leathern Pouch: For the Ancients call'd *Scorta* thoſe Things that were made of Leather or Skins, and therefore it is alſo call'd by the Vulgar the *Marſupium*, or *Burſa Virilis*, the *Manly Purſe*. In this Purſe, are contain'd the Parts which are ſaid to be deſign'd for the Generation and Perfection of the Seed; they are call'd the

the *Teſtes*, or *Teſticles*; but the *Greeks* have given them ſeveral Names: The other long and carneous Part, is call'd the *Penis*, or *Yard*; as alſo *Mentula* by the *Latins*; but the *Greeks* have appropriated divers Names to it, from its Reſemblance to a *Nail*, a *Stalk*, &c. That Part which is ſituated betwixt the Extremity of the *Penis*, and the *Anus*, is, in both Sexes, call'd the *Perinæum*, where the *Lithotomiſts* make their Inciſions to take out the Stone. The *Penis* is ſubdivided into two Parts; the firſt, which is always cover'd with the Skin, is Hard and Nervous, and is moſt generally call'd the *Penis*: The ſecond, which is of a carneous Subſtance, round, and in the Venereal Act is ſtrip'd of the Skin, but at other Times is cover'd with it as well as the other Parts, is call'd the *Glans*, or the *Gland* or Nut of the Yard. Some call it *Ceraſus*, or the *Cherry*, from its Reſemblance to it. The Skin on the *Glans* is call'd *Præputium* by the *Latins*, or the Fore-skin or *Prepuce*, being the ſame that is cut off in the Circumciſion of the *Jews*, whence they are call'd *Recutiti*. The Ligament which faſtens the *Prepuce* to the Inferior Part to the *Glans*, is call'd the *Vinculum Caninum*, or the *Frænum*, the *Bridle*. The Circle which ſurrounds the Extremity of the *Glans*, the *Corona*, or the Crown; and that Hole which is in the middle of the *Glans*, deſign'd for the Paſſage of the Seed, and of the Urine, is call'd *Urethra* in *Greek*, and *Meatus Urinarius* in *Latin*; i. e. The Urinary Paſſage.

The *Genital Parts* of Women, conſiſt of more Parts than thoſe in Men: 'Tis call'd *Pudendum Muliebre*, by the Poets; *Cunnus*, and moſt commonly *Vulva*, becauſe it has, as it were, two *Valvulæ*, or *Valvæ*, one on each Side of the *Fiſſura*. Thoſe which muſt be conſider'd in the firſt Place, and are call'd the *Labia*, or Lips of the *Vulva*, by *Hipocrates*, are two Oblong Bodies, of a ſoftiſh, carneous and ſpongeous Subſtance: In the middle of which is what they call the *Fiſſura Magna*, or *Great Orifice*, to diſtinguiſh it from that which makes the Exterior Orifice of the Womb, which is much leſs. If you draw theſe two *Labia's* aſide, there appear two other Bodies call'd *Nymphæ*, and by ſome *Alæ*: They are two Productions (on each Side one) conſiſting of a fungous Fleſh, conjoin'd at the Beginning, and plac'd under both the *Labia* of the *Vulva*. They are contiguous to one another, and aſcend to the Extremity of the Conjunction of the *Oſſa Pubis*, where being join'd togcther they cover the *Clitoris*, like a Prepuce or Foreskin. At the very Point of them is ſeated the *Clitoris*, which by ſome of the Modern Authors is call'd the *Penis*, or *Mentula Mulicbris*. It is a ſmall Proceſs plac'd on the Anterior and Superior Part of the *Pubes*, where the *Nymphæ* are join'd together, reſembling in many Things to the *Manly Yard*, *viz.* in its Poſition, Subſtance, its Repletion with the Spirits, and in its Erection. If you draw the *Nymphæ* ſomewhat aſunder, you will meet with another *Rima*, or leſſer Chink, which forms the *External Orifice, or Neck of the Womb*; and above this with another Hole, which ariſes from the Implantation of the Neck of the Urinary Bladder in that Part. In the before-mention'd *Rima Major*, are to be ſeen four Caruncles, which are call'd *Myrtiformes*, from their Reſemblance to the Myrtle-berries: The foremoſt of them covers the *Foramen*, or Hole of the Urinary *Meatus*, which opens hereabouts; the other, which is ſituated oppoſite to this, is the hindermoſt; the other two are at the Sides. Theſe *Caruncuiæ* remain conſpicuous, as well in Young as Old Women, even till Death; tho' in thoſe that never have born any Children, they appear more entire and compleat. Theſe Caruncles are join'd together by an intermediate Membrane, which is perforated in the middle, call'd the *Hymen*, of which ſo much Noiſe has been made by the Anatomiſtical Authors, becauſe it is look'd upon as the true Sign of Virginity, and may be taken for ſuch when it is actually there; of which we ſhall ſay more hereafter, in the *Hiſtory of the Womb*.

CHAP. V.

Of the Denomination of the Hand, *and of the Parts thereunto belonging.*

AFTER the Denominations of thoſe Parts that offer themſelves to our View, without any previous Diſſection in the three *Venters* of the Humane Body, 'tis Time now we ſhould proceed to the Limbs. We call the *Artus*, or Limbs, thoſe Parts of our Body which branch out from the Trunk like the Branches of Trees: Theſe are the *Hands* and the *Feet*. The *Hand*, is call'd all that Part which is contain'd betwixt the *Summus Humerus*, or the Joint of the Shoulders, and the laſt Extremities of the Fingers; and this is according to its moſt ancient Signification: For in that Senſe, both *Homer*, and after him *Hippocrates*, have uſed it. *Galen* has divided it into three principal Parts; to wit, the *Arm*, the *Cubit*, and the *Hand* (properly ſo call'd). The Arm, or the *Humerus*, is call'd that Part which, beginning at the Shoulder, reaches to the next Joint, or the Flexure of the Elbow, or the Incurvation of the Arm: Oppoſite to which is the *Olecranon*, or the Exterior Protuberancy, or Gibboſity of the *Cubit*. The *Ulna* and *Cubitus*, are thoſe Parts, which from the Extremity of the Arm, or the *Humerus*, extend to the *Hand* (properly ſo call'd). And this *Hand* begins at the Extremity of the *Cubitus*, or the *Ulna*, and terminates at the Extremities of the Fingers. The Interior and Concave Part of the *Hand*, is call'd *Vola* by the *Latins*, and that which is oppoſite to it on the other ſide, *Dorſum*, or the Back; *Palma*, or the *Palm*, is when the Hand is expanded, as *Pugnus*, or the *double Fiſt*, is when it is contracted. In the *Vola* of the *Hand* are the *Lines* and *Hills*, as they are call'd by the Chiromantiſts: The chief among the firſt is the *Line of Life*, as they call it; becauſe from its Length or Shortneſs they pretend to judge and foretell either a long or ſhort Life. Commonly there are three Lines moſt conſpicuous in the Inſide of the Hand: One, which ariſes from the Bending of the Thumb, and is call'd the *Line of Life*. The ſecond, ariſing from the Flexion of the four Fingers, is call'd the *Line of the Brain*: And the third, which is owing to the Bending of three Fingers only, is call'd the *Menſalis*, or *Table-Line*, becauſe it forms a *Trapeziuno* with the former. What they call the *Monticula*, or *Hillocks*, are certain ſmall Prominencies in the *Vola* of the Hand: Of theſe, the Chiromantiſts account no leſs than Seven; each of which is dedicated to a certain Planet. Thus the Protuberancy of the Thumb they dedicate to *Venus*; that of the *Index*, to *Jupiter*; that of the middle Finger, to *Saturn*; that of the annular Finger, to the *Sun*; that of the little Finger, to *Mercury*: The Triangle in the *Vola* of the Hand is dedicated to *Mars*; and the *Hypothenar*, to the *Moon*.

For the reſt, the *Hand* (properly ſo call'd) is ſubdivided into three Parts; to wit, the *Carpus*, the *Metacarpus*, and the *Digiti*, or the Fingers. The *Carpus*, or the Wriſt, call'd by the Latiniſts the *Brachiale*, is that Part of the Hand which is next adjacent to that Part which joins the broad Part of the Hand to the Cubit or Elbow. The *Metacarpus*, call'd by ſome the *Poſtbrachiale*, but by the true Latiniſts *Palma*, or the *Palm*, is that Part which is ſituated betwixt the Wriſt and the Fingers, of which there are five in all. Two of theſe which are plac'd on both Sides of the breadth of the Hand, have obtain'd their Names from their Magnitude; as the other three have theirs from their Poſition and Functions. *Magnus Digitus*, or the *Pollex*, i. e. the Thumb, is ſo call'd, becauſe it exceeds in Bigneſs and Strength all the reſt: Hence it is, that the *Greeks* have given it the Name of ἀντίχειρ, or *Promanus*, i. e. the *Forehand*, as if it perform'd the Functions of all the other Fingers of the Hand. The other Finger that has borrow'd its Name from its Magnitude, is the *Minimus*, or little Finger, call'd alſo *Auricularis*, or the Ear-Finger, becauſe, as I ſuppoſe, we pick

pick our Ears with that Finger. The Finger that is next to the Thumb, is call'd *Demonſtratorius*; in *Latin*, the *Index*; becauſe we moſt commonly point at any Thing with this Finger. The next to this is call'd the *Medius*, or *middle Finger*: Some of the Poets have call'd it the *Impudicus* and *Obſcænus*. The fourth is call'd the *Annulaus*, or the *Annular Finger*, becauſe Men moſt generally wear their Rings on that Finger; by ſome it is call'd alſo the *Medicus*, becauſe the *Egyptian* Phyſicians having a fabulous Story current among themſelves, that a certain Nerve was immediately tranſmitted from the Heart to this Finger, judged it reaſonable to dignifie it before all the reſt, with wearing their Rings upon it.

All thoſe Parts or Interſtices of the Joints of the Fingers, are call'd by *Ariſtotle*, the *Phalanges*; and by *Gaza*, *Internodia*, or *Internodes*; as the Joints themſelves, and their Prominencies, when the Hand is contracted into a double Fiſt, are by the ſame Author expreſs'd by the Word *Nodi*, or *Nodes*. *Ariſtotle* attributes one *Condylus* to the Thumb, and two to the reſt of the Fingers. But I have met with three different Sorts of *Condyli* by the Authors; to wit, the *Condylus*, properly ſo call'd, being the middlemoſt *Nodus* of the Fingers, when they are contracted inwards. The *Procondylus*, being that which is neareſt to the Nail; and the *Metacondylus*, which is neareſt to the *Metacarpus*. The *Latins* have no peculiar Names for them, but promiſcuouſly expreſs them by the Words, *Nodi*, *Internodia*, or *Articuli*; or the *Nodes*, *Internodes* and *Joints*. The Extremities of the Fingers are, as it were, defended by Nails: Theſe Extremities were by the Ancients call'd, the *Roots of the Nails*; but by the more Modern Authors, theſe Words ſignifie as much as the Margins or Edges, from whence they ariſe. Near unto this is conſpicuous, a certain Semilunar whitiſh Spot, call'd *Exortus*, or the firſt Riſe; becauſe it is ſituated near the Place where the Nail has its Riſe. The ſmall whitiſh Spots that appears ſometimes on the Surface of the Nails, is call'd *Onyx*, and *Nubecula*, or a little Cloud, from its Reſemblance; and the laſt Extremities of the Nails, are call'd ἀκρωνυχία, by the *Greeks*.

CHAP VI.

Of the Denominations of the Feet, and the Parts thereunto belonging.

THE only Thing now remaining is the *Foot*, call'd *Crus* by *Gaza*; and by the Modern *Latins*, the *Magnus Pes*; i. e. the *Great Foot*, being deſtitute of any other peculiar Word. Under the Name of *Pes Magnus*, is comprehended all that Part, which beginning at the *Clunes*, or Buttocks, reaches to the utmoſt Nails of the Toes. It is divided into three Parts, to wit, the *Femur*, or the Thigh; the *Tibia*, or the Leg, and the *Pes parvus*, or the Foot, properly ſo called.

The firſt Part of the *Femur* is call'd alſo the *Coxa* by *Celſus*; which is very well worth our Obſervation, conſidering that theſe two Words are promiſcuouſly uſed by the Authors. The Interior Part of the *Femur* is call'd the *Femen*; and the Exterior Protuberancy near the Joint, the *Coxendix*; and the Space betwixt the two Thighs, which is adjacent to the Buttocks, the *Perinæum*, or by the *Latins*, *Interfemina*.

The Second Part is the *Tibia*, or Leg, (properly ſo call'd) which Word bears an ambiguous Signification, being ſometimes taken for all that Part which is ſeated betwixt the *Femur* and *Pes parvus*, conſiſting of two Bones, which we are ſpeaking of at this Time; but ſometimes alſo for that particular Bone which is the biggeſt of the two: Juſt as the *Cubitus* is taken ſometimes for both the Bones of the *Cubit*, and at other

times only for that which is the longeſt of theſe two. *Celſus* calls it *Crus*. Its Anterior Part is call'd *Anticnemion*; the *Latins* have no peculiar Word for it, tho' ſome have given it the Name of *Antitibiale*, or *Protibiale*, after the *Greek*: *Gaza* calls it *Crea*, which is a very ancient Word. The Poſterior Part is call'd *Gaſtrocnemion*, i. e. the *Belly of the* Tibia, in Latin *Sura*, or the Calf of the Leg, being the carneous Part of the *Tibia*. The Outſide of the *Tibia* is call'd *Paracnemion*, and the Inſide *Procnemion*.

On the Superior Part of the *Tibia* is a Joint, where it is articulated with the *Femur*, which is call'd *Genu*, the *Knee*. Its Anterior Part, or rather the Bone it ſelf which covers the Knee, is call'd the *Mola*, and by *Celſus*, *Patella*, *Mola*, *Genu* and *Rotula*, the Knee-pan. But the Poſterior Part where it is incurvated or bends inward, is call'd *Poples* by the *Latins*, whence the noted *Vena Poplitea* has obtain'd its Name; becauſe it runs through this Part and the Leg to the Foot.

Laſtly, in the lower Part, where the *Tibia* is join'd with the Foot, there are two hard and oſſeous latereal Prominencies; one of which is call'd the *Interior*, and the other the *Exterior*, being the Proceſſes of the Bones of the *Tibia*, and of the *Fibula*; they are call'd *Malleoli* by the *Latins*, from their Reſemblance to a Hammer: For in this Place you ſee on both Sides the Protuberancies of the ſmall Heads, in *Engliſh*, the Ankles. They are frequently call'd *Tali*, by the Phyſicians, as when in the Suppreſſion of the *Menſes* they order the Veins of the *Talus* to be open'd, but erroneouſly. Tho' this vulgar Error is of ſo ancient a Date, that *Galenus* has already taken notice of, and given a Caution againſt it in his Time, notwithſtanding which it has continued to our Times. For theſe Proceſſes don't form the *Talus*, but the *Talus* or *Aſtragalus* lies conceal'd under them, being not obvious either to the Touch or Sight, by reaſon of the Tendons and Ligaments.

The Third Part is the *Pes parvus*, or the Foot (properly ſo call'd), which beginning at the *Tibia*, ends at the very Points of the Toes. *Plato* calls it the *Pes extimus*. It is divided into three Parts (like the Hand), to wit, into the *Pedium*, *Metapedium*, and the *Toes*. The *Pedium*, or the firſt Part, call'd by *Ariſtotle* the πλέυρα, or the *Caleaneus*, and moſt commonly the *Tarſus*. The ſecond Part, where begins the firſt Articulation of the Bones, that make up the *Planta*, is by *Ariſtotle* diſtinguiſh'd into two Parts; to wit, the Superior, which is alſo call'd the nervous Part; and the Inferiour or the carneous Part. The firſt is call'd by the *Latins* the *Dorſum*, or back of the Foot, or Inſtep; and the latter, *Concavum* or the Concave Part, or Sole of the Foot. Thoſe that want this Cavity, but touch the Ground with the whole Foot, are call'd *Planei*, or Flat-footed. The third Part contains the five Toes, which are correſpondent to the Fingers in the Hand: The Names are, the great Toe, the next to the great Toe, the middle Toe, the next to it, the little Toe. The Extremities of all of them are defended by Nails: They conſiſt each of three Bones, and as many Joints and Articulations, as will be ſhewn hereafter in the *Hiſtory of the Bones*; one of theſe Joints is more incurvated than the other two.

CHAP. VII.

Of the Magnitude and Figure of the Human Body, and their Differences in reſpect to the Age, Sex, Diſtempers and Climates.

IN the preceding Chapters, we have given Account of what ſeem'd to have a Relation to the Denominations of the External Parts: But before we entirely leave this Subject, let us alſo take a View of the Magnitude and Figure, as well of the whole Body,

as

as of the Proportion there is betwixt each of its Parts, and what Difference ariſes betwixt them, in reference to the Age, Sex, Climate, and Diſeaſes.

It admits of no ſmall Diſpute with ſome, Whether the Figure of the whole Body be quadrangular or circular, or whether it be neither of the Two? For thoſe that have given the Name of *Quadratus* to a Man, ſhaped, as they ſay, according to the Rules of Nature, doubtleſs intend to make him of a quadrangular Figure: As on the other Hand, thoſe that have conſidered the Navel, as placed in the Middle or the Center of the Body, from whence Lines might be drawn at equal Diſtances to the Extremities upwards and downwards, ſeem to have attributed to it a circular or rotund Figure. But ſince the firſt ſpeak only of the Trunk of the Body, and the laſt make a wrong Inference, both theſe Opinions are erroneous. For the humane Body is not of any certain ſimple Figure, but a Compoſition of ſeveral Figures of its external Parts. Neither is there any Figure to be named, which may be properly attributed to it, unleſs you would ſay it is, or will call it, the *humane Figure*; and even that is ſcarce to be determined, conſidering that it depends on the Will and Pleaſure of every Man to change his Figure almoſt every Moment: From whence it is obvious, that ſince Man, *Prometheus*-like, may aſſume different Figures every Minute, no certain determinate Figure can be aſſigned to the humane Body.

Notwithſtanding all this, the Cognition of the Figures of the Parts is abſolutely neceſſary to a Phyſician, not only the better to inveſtigate the Diſeaſes themſelves, but alſo to regulate his *Prognoſis* with Prudence concerning the Event, and to facilitate or accompliſh the Cure. Thus in the Diſcovery of Diſeaſes, the Fractures or Luxations of Bones are ſcarce to be known by any other Way, becauſe we are ſenſible, that the Parts to which they belong, cannot be ſhaped or figurated as they ought to be. As to the *Prognoſtical* Part, *Hypocrates* has ſufficiently maintain'd its Uſefulneſs in this Reſpect, in his Book, wherein he treats of the Figure of a healthy Perſon, and what is to be hoped for or expected from ſick Perſons. And in the Cure of Fractures and Luxations, he that is ignorant of the Figure of all the Parts, will certainly attempt it without any Proſpect of Succeſs.

As to what concerns the *Magnitude*, it is three-fold; to wit, in reſpect of the three ſeveral Dimenſions, in Longitude, Latitude, and Profundity. Theſe conſiſt either in a well-proportion'd Mediocrity, or decline from it either in Exceſs or Defect, more or leſs. But to give you a true *Idea* of the Matter, 'tis requiſite we ſhould explain what is the Magnitude of a humane Body, according to the Force and abſolute Rules of Nature, that ſo we may have before us a Body, which, like the Statue of *Polycletus*, may ſerve as a Standard whereby to meaſure all the reſt; this being the right Way to determine, and be ſatisfied without further Trouble, what Body it is that is to be cal'd long or ſhort, ſlender or thick, broad or ſtreight.

Such a Body then, according to the *European* Standard, muſt be one that has Six Geometrical Feet in Length; in its Latitude and Thickneſs one Foot and a third Part: Thoſe that decline from this Proportion, muſt be call'd Ill-proportion'd. Yet this Proportion muſt not be confin'd to ſuch ſtreight Bounds, in Reſpect either of its Defect or Exceſs; but that ſuch Bodies as do not recede far from this Rule, may yet be included within the Catalogue of well-proportion'd Perſons. Thus he muſt be called *Tall*, according to this Rule, who meaſures Seven Foot, or little leſs, in Highth; though for the reſt, he be, as to his Breadth and Thickneſs, ſuitable in Shape to a well-proportion'd Body: As on the contrary, he is to be call'd a *little Man*, who wants ſomething conſiderable of Six Foot in Length, but nevertheleſs, in the other Dimenſions, has his Meaſure proportionable to a right proportionated Body. Thoſe are call'd thick or fat Men, which, though they approach to the Height of Six Foot, yet the Diameter of their Breadth is above one Foot, or they meaſure in the Circumference of the *Thorax*, or of the inferior *Venter*, above Three Foot; for in a well-proportion'd Body, the Thickneſs is juſt half the Meaſure of the Length, and conſequently exactly Three Foot; as on the other Hand, thoſe that do not come near

to Three Foot in their Circumference, are call'd *Lean.*

These Rules concerning Magnitude are set down here, to shew how it is most commonly observed in humane Bodies; for, after all, there is still a great Inequality among our Bodies, depending on the different Ages, Sex, Climate, and Diseases.

As to the different Ages, it is obvious, that there is a considerable Diversity betwixt the Magnitude of an Infant, a Boy, a Lad, a young Man, and a Person that is come to his full Growth and Maturity; as also of an aged and a decrepit Person. An *Infant* is very small and short; a *Boy* much bigger, and still longer; but a *young Man*, or one that is come *to his full Growth and Maturity*, is not only taller in Heighth, but also more corpulent; it happening in young People as in many Trees, which whilst they are as yet young, grow up very fast in Heighth, but remain thin in the Stem; till being grown to their full Heighth, the Trunk becomes ticker by Degrees. As to *decrepit Persons*, there is no small Dispute concerning what has been asserted by some; to wit, that their Bodies decrease, and that they become shorter or lower in Stature, as they grow older. I deny, that they decrease in Length; but am willing to grant, that they do so in Breadth or Thickness. For the Bones unto which the Length of the Body is proportioned, being hard and solid Parts, cannot suffer any Diminution, neither by Age, nor the Continuance or Violence of any Disease: But the fleshy Part, as it may be diminished and consumed by several other Causes, so it may also by Age. If aged or decrepit Persons seem to be shorter than they were in their younger Days, that must be attributed to another Reason; to wit, that all their Joints are as it were contracted and incurvated, because the Muscles are shortened, or become more loose for want of sufficient natural Heat, and their Ligaments dry'd up, and as it were become callous.

There is also a certain Difference observable in the *Magnitude*, in reference to both Sexes; for in humane Bodies the Female is most commonly not so big as the Male; whereas in other Animals, the Female is generally the bigger of the Two. This is even observable in the Insects themselves, as in the *Flea*, the *Fly*, *&c.* as likewise in those that are sanguineous, as in the *Viper*, the *Serpents*, *&c.*

The Reason seems to be, that in Brutes, the Females carry at one and the same time more Eggs, or more young Ones, in their Bellies, which require a larger Body; whereas in humane Kind, the Female carrying but one *Fœtus* at a time, she had no Occasion for so large a Body: Considering especially, that the chief Business of Women was to bear, bring forth, and educate their Children, they did not stand in need of so strong and large a Body to perform these Functions, as the Men, who (besides that they undergo more Fatigues) being framed (in a more peculiar Manner) after the Image of the *great Creator*, and design'd for the Government of all the other Creatures in the World, should be conspicuous as well for their Excellency of the Body, as of the Mind. Neither ought it to be passed by in Silence here, that Maidens are most commonly slenderer than married Women, because they grow bigger after the Venereal Congress, the Veins of the whole Body being in the Venereal Embraces dilated by the Exagitation of the Heat. This is sometimes observable in some Women even within one or a few Days after the Congress.

Concerning the Diversity there is in the Magnitude of humane Bodies, in reference to different Countries or Climates, *Hyppocrates* has treated of that Point in his Book of the *Air*, *Waters*, and *Places*; and concludes at last, that in *Asia* every Thing grows much larger and handsomer than in *Europe*, which must be attributed to the Temperature of the Seasons of the Year: For *Asia* being situated in the midst of the *Orient*, is the more remote from any Excess of Cold or Heat. The *Europeans* themselves differ very much both in their Magnitude and Shape. Thus the *Danes*, the *Netherlanders*, and the *Germans*, are, generally speaking, of a large Stature, and handsome; and so are the *English* and *Scotch*; whereas, on the contrary, the *French* and *Spaniards* are short; the *Italians* and *Grecians* of a middle Stature; the *Venetians* are remarkable for their Tallness, and the excellent Proportion

tion of their Limbs. But this is chiefly obſervable among the ancient Noble Families, which retain the Marks of their ancient Deſcent on their very Perſons; whereas the vulgar Sort, being a Mixture of all Nations, are promiſcuouſly ſome Tall, ſome Short. Concerning the *Pygmies*, which are not above a Yard long, if you will believe ſome of the Ancient Authors: Theſe I look upon as Fictions, relying not only in this Point upon the Authority of that learned Geographer *Strabo*, but more eſpecially upon our own Experience; becauſe, tho' in our Times the greateſt Part of, if not all, the habitable World, has been view'd by our Mariners, never any thing like it has ever been ſeen or heard of in thoſe remote Parts. Add to this, That *Francis Alvarez* a *Portuguſe*, who has travell'd in thoſe very Parts, where *Ariſtotle* has plac'd his *Pygmies*, to wit, through which the River *Nile* takes its Courſe into *Egypt*, tells us expreſly, That he did not meet in any of thoſe Countries with ſuch a ſmall Generation of Men, but that the People were Negro's of a middle Stature.

Diſeaſes have alſo their Share in altering the Magnitude of the Body, there being not wanting Inſtances of certain Perſons, who by a Feaver have been extended to an almoſt Gygantick Stature. There are few but that have heard of *Anthony* of *Antwerp*, who was ſtill living in our Time, and being born a very ſmall and weak Child, did afterwards by a Diſtemper riſe up to a Gygantick Size. Theſe are call'd by the *Greeks* ἐξηράπλοι, who have a vitious Diſpoſition, that produces a prodigious Increment, and a ſudden Death. Thus at *Salamina*, the Son of *Euthemion* did grow Three Cubits in Three Years time; but was very ſloathful and heavy-headed, and coming to the Age of Puberty, was taken off by a ſudden Contraction of his Limbs, as *Pliny* relates it. And the ſame Thing happen'd to the Son of *Cornelius Tacitus*, the famous *Roman* Hiſtorian, who dy'd in a miſerable Condition before he arriv'd to the Age of Puberty. Sometimes it happens alſo, that after ſome Diſeaſes, tho' the Body doth come to its natural Growth and Size, the Arms and Legs remain ſmall and tender; in the ſame manner as it is obſervable in ſuch Luxations as are not reduc'd to their natural Poſition.

It is a common Opinion, that the Bodies of Men in very ancient Times were much bigger than ours, and that the Bulk of Men decreaſes in proceſs of Time. If any Credit is to be given to the ancient Hiſtories; the Body of *Oreſtes*, which was by a ſpecial Command of the Oracle dug up from under Ground, was no leſs than ſeven Cubits in length; which according to *Gellius*, makes twelve and a quarter *Roman* Feet. And *Pliny* tells us a Story of a Body, that was found in the Iſle of *Candia* on a Mount, after a moſt violent Earthquake, which was Forty Seven Cubits long; and was by ſome taken for the Body of *Orion*; by others, for that of *Oetus*.

Here I am oblig'd to repeat what I told you before, that there is no exact determinate Magnitude to be ſet for the Humane Body, but that it varies very much, according to the different Ages, Diſeaſes, Sex, and eſpecially to the different Country wherein Men are born: So that I am not averſe to believe, that the Ancient *Greeks* might be very large and ſtrong-body'd Men; but being intermix'd afterwards with other Nations that made their Settlements there, their Poſterity prov'd not of the ſame Bulk, and for that Reaſon they imagin'd, that they grew leſs and leſs in proceſs of Time. I my ſelf remember the Time, when in the *Netherlands* there was, generally ſpeaking, a much larger and taller Set or Size of Men, than now they are; which I attribute to their being intermix'd with other foreign Nations, the Stock of the old Natives being much exhauſted by the long Wars. But as to the Stories of the Body of *Oreſtes*, and much more of that found in *Candia*, they muſt be look'd upon altogether as Fabulous; or if there is ſomething of Truth in them, they muſt be number'd among the Monſtrous Bodies, ſuch as are very rarely to be met with. If you will inſiſt upon the Authority of *Pliny*, who ſpeaks it upon his own Credit, that the Children don't grow to the ſame Highth as their Parents did. We will contradict his by our own Experience, it being obvious by daily Obſervation, that not only Grand and Great-Grand-Children are as luſty and well

well proportion'd as their Grand and Great-Grand-Fathers, but alſo that nothing is more common than to ſee Sons taller than their Fathers.

CHAP. VIII.

Of the Figure and Magnitude of the Head, *and the Parts thereunto belonging.*

WE will now come to the Conſideration of the Parts in particular; as to their Figure, Magnitude, and what Proportion they bear to one another, and will begin with the Head.

The Head, according to its natural Conformation, ought to be of an Oblong Spherical Figure; yet ſo, that it be ſomewhat flatiſh on both Sides near the Temples. Its true Magnitude, if you take it Length-ways, ought to make up the ſixth Part of the whole Body, meaſuring from the lower Extremity of the Chin to the Crown of the Head. But to fix alſo its due Proportion within itſelf, it muſt be diſtinguiſh'd by four Lines that ſhould be equal to one another. The *firſt Line*, is that which we will call the *Line of the Face*, beginning from the lower Extremity of the Chin, to the upper End of the Forehead. The *ſecond*, we will call the Line of the *Occiput*, which is to reach from the Crown of the Head, down to the firſt *Vertebra* of the Neck. The *third*, is that of the *Forehead*, reaching from one of the Temples to the other. And the *fourth*, is to begin at the Inferior Part of the Ear (where the Mammillar Proceſſes are) and to reach up to the moſt riſing Part of the *Synciput*. Theſe Lines, if they are of an equal Length, the Head is exactly well proportion'd; but if they are unequal, it may be ſaid, that the Head is ſo far declining from its natural and exact Proportion, as this Inequality is different betwixt them.

So that if the Line of the Face be longer than the reſt, it muſt be call'd a long Face; if ſhorter, a ſhort One: If the Line of the Forehead be longer than the reſt, it will be a broad Face; if that of the *Occiput*, it will be a ſharp-pointed Head; if they are all alike, the Head will be round, and of its natural Figure; if they are all unequal, or moſt of them, it makes ſuch a Head as is call'd φοξὸν, by *Hippocrates* and *Galen*; and this Difference ariſes, either from the Difference of the Climate, or of the Diet, or perhaps from ſome other accidental Cauſes. Thus *Hippocrates* tells us of the *Macrocephali*, that their Heads uſed to be ty'd too hard together whilſt they were Infants. Thus they ſay, that the *Muſcovites* have broad Faces, becauſe they form them in that Shape, whilſt the infantile Bones are as yet very pliable and tender. Thus the *Hollanders* and *Genoeſe* have high and pointed Heads, which is alſo attributed to their way of binding up the Head of their Infants. The *Germans* have commonly ſhort Heads, becauſe they lie conſtantly on their Backs in their Cradles. *Hippocrates* mentions, That thoſe that uſe a very ſpare Diet, have long Heads; becauſe the Temporal Muſcles are exſiccated, and the Temples contract a Hollowneſs, which takes off much from the Breadth of the Face.

The *Neck*, according to its natural Figure, ought to be round, but it is not every way of the ſame Length: For in its Anterior Part from the Chin to the *Jugulum*, it ought to be four Geometrical Inches long; but its Poſterior Part from the Extremity of the *Occiput* to the firſt *Vertebra*, three: On the Lateral Parts, from the Tip of the Ear to the upper Part of the Shoulders, about ſeven. The Breadth or Diameter of the Neck is of four Inches, and its Circumference one Foot. *Hippocrates* has made this Obſervation, That thoſe that have a ſtrong Neck are Robuſt, but eſpecially in their Bones; becauſe the *Vertebra* of the *Thorax* of the

Loin

Loins of the *Os Sacrum*, uſed to be proportionable to thoſe of the Neck, unleſs Nature deviates from her own Rules of Proportion; and if it be conſidered, that all the other Parts are correſpondent to the Magnitude of the Bones; ſince large Bones require large Muſcles to move them, and theſe again require large Veins, Arteries and Nerves, ſuch as may be ſufficient to ſupply ſuch large Muſcles with a ſufficient Quantity of Heat and Animal Spirits; this ſeems naturally to imply, That ſuch as have a ſtrong Neck, are of a robuſt Conſtitution.

CHAP. IX.

Of the Figure and Magnitude of the Thorax *or Cheſt, and of the Breaſts.*

THE *Thorax*, or *Middle Venter*, is of an Oval Figure, being ſtraiter on its upper Part where it is conjoin'd with the Neck, and broader in its Inferior Part where it is adjoining to the *lowermoſt Venter*; before on the Breaſt, and behind at the Back, it is ſomewhat flatter. Its natural Proportion is computed thus; The *Breaſt*, which begins at the *Jugulum*, and terminates at the *Cartilago Mucronata*, contains eight Geometrical Inches. The *Back*, from the firſt *Vertebra* of the *Thorax*, to the Extremity of the Twelfth, or the Beginning of the Loins, a Geometrical Foot and one Inch; ſo that the Breaſt is five Inches ſhorter than the Back. The Sides are meaſured from the *Claviculæ* to the Extremity of the *Thorax*, where the ſpurious Ribs end, nine Inches and a half. The Circumference of the *Thorax* is moſt commonly two Geometrical Feet and two Inches. The *Thorax* is contracted about the breadth of an Inch in *Expiration*, but is dilated two Inches in *Inſpiration*. This is the natural Proportion of the *Thorax*, which nevertheleſs is ſubject to various Alterations, either by Nature or ſome Internal Cauſes, or elſe by Art and External Injuries. By *Nature*, when its Conformation is vitiated in the Womb by *Internal Cauſes*, when a Gibboſity is cauſed by Defluxions: By Art, when it is roll'd up too ſtrait in Infants. For the Ribs, eſpecially of Infants, being very pliable and ſoft, they may be brought almoſt into what Figure you pleaſe; but when they are contracted too far beyond their natural Poſition, it cauſes an Auguſtation of the Breaſt, and produces Defluxions, ſpitting of Blood, Conſumptions and Inflammations: And 'tis for this Reaſon that the *Venetians* are very careful not to roll their Infants too cloſe about the *Thorax*, which being not obſerved by ſome other Nations, and eſpecially by the *Engliſh*, renders them very ſubject to Conſumptions.

The Breaſts are ſeated upon the Breaſt; which are different alſo according to the Age, Sex, Diſeaſes, and ſome other Accidents. For they don't riſe very high in Men, becauſe they have ſcarce any Glandules; but in Women, they ſwell into a roundiſh Figure. In Virgins alſo, before they ariſe to the Age of Puberty, there is ſcarce any Thing to be ſeen of their Breaſts, except the Nipples; but they encreaſe as they advance in Years. In old and lean Women they hang down, becauſe the Glands being conſumed, together with the Fat, there remains nothing but the bare Skin; whereas in fat People they are plump, and ſometimes very large. In Childbearing Women, they encreaſe with the *Fœtus*, and grow very big when the Time of the Birth draws near. Wherefore he that would ſee their Breaſts in their right Proportion, let him caſt his Eyes upon an adult Virgin of a well proportion'd Stature, where he will meet with them of ſuch a Magnitude, as may be cover'd conveniently with his Hands; and this Proportion ought not to be neglected

in the Choice of Nurſes. The Nipples, which are plac'd in the Center of the Breaſts, do alſo vary in Women: For in Virgins they are only juſt riſing outward, and ruddy like a Field-Strawberry; but in Women that give Suck, they are drawn out, more and pale; but in thoſe that are paſt Children, they are very long, and of a blackiſh Colour.

CHAP. X.

Of the Proportion of the lowermoſt Venter, *and of the* Pudenda *in both Sexes.*

THE lowermoſt *Venter*, in its natural Proportion, ought to have the Navel for its Center; ſo that there being the ſame Longitude, to wit, of ſix Inches from the Navel to the *Cartilago Mucronata* upwards, and to the *Oſſa Pubis* downwards; and on the Sides, to the Extremities of the *Oſſa Ilium*, and of the Loins, its whole Circumference ought to be of two Geometrical Feet and Two Inches, or Twenty ſix Inches in all; and its Diameter, reckoning from the Navel to the Back, about Nine or Ten Inches. But this Proportion alſo differs very much, and proceeds either from Natural, or elſe from Preternatural Cauſes. From Natural Cauſes, as from the Food and Drink, from the *Fœtus* in the Womb, and too much Fat. From Preternatural Cauſes, as from a flatulent Humour in the *Timpanitis*; from Water in the *Aſcites*; from a Tumor in the Affections of the Spleen. On the other hand, the Belly is ſometimes quite flat from abſtinence from Food, from long and violent *Diarrhœa's*, *Diſenteries*, and Superpurgations. Hence it is, that *Hippocrates* (*lib. de vet. Medicin.*) adviſes Phyſicians to take notice, whether the Patient has a long and round Belly; for thoſe that have a round and well-ſet Belly will bear ſtronger Purges, than thoſe that are very flat and thin in thoſe Parts. On the other hand, Women that have very broad and thick Bellies, are not very fit for Conception, becauſe the Orifice of the Womb is too much ſtraitned by the Fat of the *Omentum*.

As to the Proportion of the *Pudenda*, to begin with thoſe of the Men: When the Yard is erected in an adult Perſon, it ſhould be Six Inches Long, and Four in Circumference. If it be longer or thicker, it is neither fit for Procreation, nor for the Venereal Act; becauſe it can't hold out long, the Muſcles being over burthen'd by its Weight, which elſe kept it upright: Whereas on the other hand, if it be leſs, it is more proper for Procreation, by reaſon it cauſes a greater Titillation in the Neck of the Womb, and is able to hold it out much longer. If the Manly Yard be too long, it occaſions another Inconveniency alſo, to wit, an Uterine Suffocation, becauſe it relaxes the Ligaments of the Womb by the Elongation of its Neck during Coition.

As to the *Pudenda* in Women, their Proportion is commonly computed by the Magnitude of the Mouth: For thoſe that have a wide Mouth and large Eyes, have alſo large *Pudenda*; and I can ſpeak it upon frequent Experience, that all thick and fat Women, which have large Breaſts and a thick Belly, have alſo very wide *Pudenda*; as on the contrary, thoſe that have flattiſh or ſmall Breaſts, a little Mouth, a ſharp Chin, and ſmall Lips, have them much ſtraighter, and are conſequently more fit for the Delight and Pleaſure of Men. Hence it is, that not only Strumpets, but many honeſt Matrons alſo make uſe of adſtringent Peſſaries, in order to ſtraighten the Neck of the *Uterus*; but with no ſmall Danger both to themſelves and the *Fœtus*; becauſe by theſe Aſtringents they not only often interrupt or ſtop the Menſtrual Courſes, but alſo even the Paſſage of the *Fœtus* into the World, which ſometimes ends in the Death both of the Mother and the Child; of which, there there are a great many Inſtances.

CHAP.

CHAP. XI.

Of the Mutual Proportion of the Limbs.

THE *Limbs*, or the *Hands* and *Feet*, bare ſo near a Proportion to one another, that thoſe which have long Feet, have alſo long Hands or Arms. But the Limbs of the Right Side, as well Hands as Feet, are always thicker and ſtronger than thoſe of the Left; which muſt be attributed to the more frequent Motions and Exerciſes of thoſe Parts, which are oftner perform'd by thoſe of the Right, than of the Left Side. Hence it is, that ſuch as are Left-handed, have the Left Arm thicker than the Right. Theſe Parts may alſo contract a Preternatural Craſſitude, as when they are ſwell'd; or may be ſmaller than they ought to be, if the Afflux of the Alimentary Juice thither be ſtop'd or interrupted, as it happens in Luxations, which are not reduc'd into their natural Poſition, but eſpecially Children or young People. The *Hands* and *Feet* therefore are of an equal Length in a well-proportion'd Body; *i. e.* If you meaſure from the *Os Pubis* to the Extremity of the *Calcaneum*, it will be of the ſame Length with that which muſt be taken from the Armpit to the utmoſt Extremity of the middle Finger. Furthermore, the whole Length of the Feet ought to be equal to that of the Trunk, or of the Superior Parts; *i. e.* the Diſtance there is betwixt the *Oſſa Pubis*, or the upper Part, or the *Vertex*. That the whole Leg of a well-proportion'd Body will contain Three Foot, becauſe the whole Body has Six in Length: So that thoſe that are either exceſſive or defective in this Meaſure, are either long or ſhort Leg'd. I muſt not forget to add, it being a Thing founded upon my own and often retierated Experience, That thoſe that have long Legs, are very eaſily to be purged, and for that Reaſon we muſt be cautious not to preſcribe them any ſtrong Purgations.

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HIS

OBSERVATIONS

RELATING TO

The HISTORY *of the* BONES.

CHAP. I.

Treats of the Nature, Uſes, and Differences, of the Bones.

IN the preceding Piece, we have given you an Account of the External Parts of the humane Body, and their Denominations, Figure, and Magnitude; that ſo by giving firſt of all a confus'd, or rather a general *Idea* of all the Parts of the Body, we might prepare your Minds for a more diſtinct and particular Cognition of them; and proceed now to thoſe Parts that do not offer themſelves to our View without a previous Diſſection. We have thought fit to begin with the Bones; for as the Bones are the *Baſis*, or as it were the Foundation-Pillars of the whole Body, and its Parts, ſo the Doctrine and Cognition of them has not without great Reaſon been look'd upon by all the Philoſophers as the Foundation-Stone of Learning, as far as it relates to Anatomy. Add to this, that there is not any Thing in Anatomy that in all Probability can contribute ſo much toward the Eaſe of our Memory, and facilitate the true Apprehenſion of the Doctrine of the other Parts, than this of the Bones: For ſince moſt of the Parts that are to be expoſed to our View in Anatomical Diſſections, are either annexed to, or contained within their Compaſs, nothing is more eaſy, nor more natural, than by the Doctrine and exact Cognition of the Bones, to form our ſelves an Idea of the Poſition, Beginning, Terminations, Figure, and Magnitude, of each of theſe Parts: For what the Walls are to a Houſe, the ſame Thing the Bones are in the Bodies of Animals. For, as *Galen* has very well obſerved, (1. *de Anat. Adminiſtr.* 2.) the

the Parts of the Body are moſt frequently adapted to the Bones: Thus if the Skull is round, the Brain is certainly ſo; and if of an oblong Figure, the Brain will be of the ſame: Thus if the Jaw-Bones be ſmall, ſo as to form a round Face, their Muſcles will conſequently be ſmall; but if the ſame Bones be large and long, the Face of the Animal will be long alſo, and the Muſcles in Proportion.

But before we enter upon a particular Hiſtory of the Bones, it will be requiſite we ſhould premiſe ſomething in general concerning the Bones; but eſpecially of their *Nature*, *Uſes*, and *Differences*.

'A Bone therefore, call'd ὀστέον in *Greek*, 'and *Os* in *Latin*, is a ſimple Part of our 'Body, exceeding all the reſt in Hardneſs 'and Dryneſs, form'd for the Support of 'the other Parts." I call the Bone a *ſimple* Part, by which I underſtand a *ſimilar* Part, that is, without any Compoſition: For our Body conſiſts of Two Sorts of Parts, to wit, ſuch as are *ſimilar*, and *ſimple*, and of ſuch as are *diſſimilar*, and *compoſed*. The *ſimple* Parts are called, a Bone, Nerve, Vein, Artery, Cartilage, Membrane, and alſo the Skin; not that they are actually ſuch, (for they conſiſt of *Matter* and *Form*, and of the Four Elements, nay, of their Fibres alſo, which are intervoven with their proper Subſtance,) but becauſe they appear like *ſimple* Ones to our Senſes, and cannot be ſo eaſily divided into others, as thoſe may be that are called *diſſimilar* Parts: For in a *ſimple* Part, if you ſeparate and divide it never ſo much, each Part appears to be the ſame with the reſt; for each ſmall Fragment of a Bone is actually Bone, and may properly be called ſo, as each Part of a Nerve may be called Nerve. And for this Reaſon it is, that the Anatomiſts have call'd them *ſimilar* Parts; though in my Judgment they had better ſtyled them *Conſimiles*, that is, *alike*: For if the Matter be conſidered to its utmoſt Nicety, there is a conſiderable Difference betwixt what is *ſimile* and *ſimilar*: to wit, as much as there is betwixt the *Denominative* and the Thing from whence it has taken its *Denomination*. Thus the Angle differs from what is Angular; the Ring, or *Annulus*, from what is Annular. We have alſo call'd the Bone a *ſimple* Part, to avoid all Manner of Equivocation in the Word *Bone*, in which, ſome have included all that is join'd to the Bones, as, the Cartilages, the Ligaments, and the *Perioſteum*; in which Signification it is commonly taken by the Phyſicians, when they ſay, that the Bones are diſlocated; and therefore we have defined the Bone to be a *ſimple* Subſtance, *i. e.* free from all others; and this we aſſert to *exceed* all the other Parts in *Hardneſs* and *Dryneſs*, to diſtinguiſh them from ſome other *ſimple* Parts of our Body that are alſo *hard* and *dry*; but not to the ſame Degree as the Bones, which are the *hardeſt* of all the reſt. But becauſe the Cartilages will ſometimes alſo not only grow very hard, but in Proceſs of Time degenerate into Bones, we thought it requiſite to add in our Definition the *Uſes* and *Ends* of the Bones, whereby they are plainly diſtinguiſhable from the other *ſimilar* Parts, to wit, that they are deſigned for the *Support and Foundation of all the other Parts*; this being the chief and moſt general Uſe of the Bones.

But notwithſtanding all this, this *Uſe* is not ſo univerſal and common to all the Bones; but that there are ſome Bones belonging to the humane Body, which can ſcarce lay Claim to this Function of ſupporting the Body; for neither the Teeth, nor the *Os Jugale*, afford any Support, the firſt being intended for the Maſtication of our Aliments, and the latter for a Defence to the *Temporal Muſcle*: For which Reaſon it is, that, beſides this general Uſe, there are alſo ſeveral particular Uſes aſſigned to the Bones, three of which are mentioned by *Galen* in ſeveral Places.

The firſt among the particular Uſes is, that they ſhould be in ſtead of a Fence and Defence to the ſubjacent Parts; as the *Cranium* is to the Brain, and the *Os Jugale* to the Temporal Muſcle; the Ribs to the Parts deſigned for the *Vital Faculty*, the *Vertebra* to the *Spinal Marrow*. The ſecond particular Uſe is, to be aiding to, and to facilitate the Action of a certain Organ. Thus the *Patella* on the Knee is ſubſervient to Ambulation; the *Oſſa Seſamoidea* in the Fingers to the Apprehenſion of the Hand; becauſe they ſerve to keep thoſe Joints ſteady, and prevent their being put out of their Places whilſt they are in Motion. The Third particular

ticular Uſe is, *Apprehenſion*: This Uſe belongs to the Teeth, as well to the *Inciſores*, when they take hold of and cut aſunder the Aliments, as to the *Canini* and *Molares*; the firſt when they break, and the latter when they grind to Pieces the more ſolid Aliments.

There is a great Difference alſo betwixt the Bones themſelves; to examine all which, we muſt make our Obſervations in due Order, upon all thoſe Things which are commonly obſervable in all Parts that are formed by Compoſition.

The firſt is their *Temperament*, which though it be *cold* and *dry* in all Bones without Exception, it being that which gives them their Hardneſs and Solidity; nevertheleſs, ſome of them are much harder and dryer than others, and that not only in regard of the Difference of Age, but alſo of the Sex and Diſeaſes: and laſtly alſo, in reſpect to one another in the ſame Perſon, though of an advanced Age.

In Reference to the Age, the Bones of Children are very ſoft and moiſt, in Compariſon to thoſe of old People; nay, moſt of them ſeem rather to be Cartilages or Membranes than true Bones, till in Proceſs of Time, and by Age, they become more ſolid and dry, and are indurated by the internal Heat. This is evidently to be ſeen in new-born Infants, who for that Reaſon cannot ſtand upright on their Feet, nor are able to utter any articulated Sound or Words, till the *Os Hyoides*, which, like a *Baſis*, is placed under the Tongue and its Muſcles, is exſiccated, and become more ſolid. On the other Hand, the Bones of decrepit Perſons are exſiccated to an exceſſive Degree; ſo that here we obſerve the Cartilages to degenerate very often into an oſſeous Nature. *Ariſtotle* alſo tells us, That the Bones of Men are harder than thoſe of Women: And there are not wanting Inſtances, that in certain moſt violent and ardent Fevers, the Bones have been exſiccated to ſuch a Degree, that they have appeared more like Stones than Bones.

I ſay, in adult Perſons there is a remarkable Difference betwixt one Bone and another, as the *Oſſa Temporum Petroſa*, which have obtain'd their Cognomination from their exceſſive Hardneſs. Thus the ſmall Bones of Hearing, the *Oſſa Femoris*, *Tibiæ*, *Humeri*, *Cubiti*, *Radii*, are much harder than thoſe of the Fingers, and thoſe again exceed in Solidity the Bones of the *Carpus*, and of the *Tarſus*, as well as the *Epiphyſes*. Some of the Bones are inveſted with a hard Cruſt, tho' their Interior Subſtance is ſoft and ſpongious. Thus the *Cranium* conſiſts of a double *Lamina*; whereas others conſiſt only of one ſimple Subſtance, as the *Os Femoris*, and the other Bones that are of a very hard Subſtance.

In the Figure of the Bones, there is a very remarkable Difference; for ſome are like a Triangle, as the *Scapulæ*; others like a Quadrangle, as the two Bones of the *Synciput*; others like a *Pentagon*, as the *Occiput*. The *Os Cyboides* reſembles unto a *Cubus*: The *Os Naviculare* unto a Boat; the *Clariculæ* unto a crooked Nail: The three ſmall Bones of Hearing unto a Stirrup, a Hammer, and to an Anvil, from whence they have borrow'd their Names in *Latin*. And others, ſuch as the *Seſamoidea*, the *Fibula*, &c. have alſo obtain'd their Names from ſuch Things as they have a Reſemblance to. Some of the Bones are Incurvated, as the Ribs. Some are like a *Greek υ*, as that Bone which is placed at the Root of the Tongue, and is therefore call'd *Ypſiloides*. Others have a Compoſition of divers Figures, as the *Cuneiforme*; and many Ones there are alſo which have no Geometrical Figure or Reſemblance to any particular Thing, but nevertheleſs have each their particular Figures, (as the *Oſſa Femoris*, *Humeri*, *Cubiti*) being ſuch as does not appertain to any other Bone. Sometimes a whole Bone has obtain'd its Denomination from the Figure of its Part; thus the ſecond *Vertebra* of the Neck is call'd by *Hippocrates* the *Dens*, or the *Tooth*, from its Proceſs, which has ſome Reſemblance to a Tooth: For there are certain *Proceſſes*, *Sinus's*, and *Necks*, which have alſo their peculiar Names. Thus that Proceſs which is like a Style, is call'd *Stylordes*; that which is like a Needle, the *Belinoides*. Thoſe under the auditory *Meatus* are call'd *Maſtoides*, or *Mammillares*, becauſe they reſemble unto the Breaſts. The Proceſſes of the *Os Cuneiforme*, are call'd *Pterogoides*, or *Aliformes*, becauſe they are not unlike to the Wings of Bats.

A great Diverſity is obſervable alſo in the Bones, in reſpect to their *Meatus*, or Cavities: For ſome have a very ſpacious Cavity, fill'd up with Marrow; as the *Os Femoris*, *Tibiæ*, *Humeri*. Others have only certain *Sinus's*, or ſmall Caverns, and are ſpongious like a Pumice Stone. Such are among the larger Bones, the *Os Sacrum*, the Bodies of the *Vertebra*, the *Sternum*, the *Talus*, the *Os Calcis*; and laſtly alſo, the *Cranium*, which has an intermediate ſpongious Subſtance betwixt its two *Laminæ*. Among the leſſer ones, the Bones of the *Carpus*, and of the *Tarſus*: For, ſays *Galen* (11 *de Uſ. part.* 18.) None of the ſmall Bones contain any Marrow, nor has any remarkable Cavity, but only ſome ſmall and ſtreight Caverns; which was done for this End, that they might not be too much weaken'd in their Subſtance, if they had any large Cavities; and if they were of a larger Bulk, they might prove incommodious, by reaſon of their Ponderoſity. Some Bones are provided with *Foramina*, or Holes, and thoſe none of the ſmalleſt. Thus the *Os Occipitis* has one, through which paſſes the Spinal Marrow, and the *Vertebræ* and *Oſſa Pubis* have alſo pretty large Holes, others have only ſmall Ones; as moſt of the Bones of the Head, and that more eſpecially which is call'd the *Os Cribriforme*; and others again are quite deſtitute of Holes. As to the Surface of the Bones; ſome have it ſmooth, as the *Os Frontis*, the *Cranium*: Some are rough and unequal, as the *Femur*, the *Humerus*, and the *Os Occipitii*, which Inequalities were form'd by Nature, either for the more convenient Riſe or Inſertion of the Muſcles, or elſe to ſecure their Progreſs.

There is alſo a very conſiderable Variety in the Bones in reference to their Magnitude: For ſome Bones are of a very large Size, as the *Os Femoris*, which is the biggeſt Bone belonging to the Body, and next to this, the *Os Tibiæ* and *Humeri*. Others are of a middle Size, as the *Radius*, and the *Cubitus*: And others again are ſmall, as thoſe of the Fingers and Toes; of the *Carpus* and *Tarſus*: And others very ſmall, or the leaſt of all, as the Bones call'd the *Seſamoidea*, and thoſe belonging to Hearing. Some again are long, but ſlender, as the *Fibula*, and the Ribs. Some on the contrary broad, as the *Oſſa Innominata*, the *Os Sacrum*; thoſe of the *Scapulæ*, the *Os Frontis*, *Syncipitis* and *Occipitii*: Some are thick, as the *Aſtragalus*, and the *Os Calcis*.

In reference to the Number of the Bones; there are juſt as many, and no more, nor no fewer of them than are requiſite to perform the Functions in the Parts. For if Nature had made but one Bone inſtead of many, becauſe its Unity and Continuity might doubtleſs have been of great Advantage, and an addition to its Strength, this would not have anſwer'd the End of that Variety of Motions that is in our Body: And therefore provident Nature has acted with a peculiar Precaution in the framing of the Bones of thoſe Parts, where it was requiſite there ſhould be more than one Bone; to wit, not to make any more of them than what were abſolutely neceſſary or convenient for the Motion of the Part, or to afford a ſecure Paſſage to certain Veſſels. Thus we ſee, that the Bones appertaining to ſome Parts, which at their firſt Generation were more in Number, do in proceſs of Time, and by Age, unite together in one. Thus the Bones of the *Inferior Maxilla* is divided into two Bones in young Children, but in Time are join'd into one by Coalition. In the ſame manner the *Occiput* has three Bones, and ſometimes more, which afterwards make but one. The *Sternum* in aged People conſiſts only of one Bone, in adult Perſons of three, in Boys, before they arrive to the Age of Puberty, of Four, and in new born Children of Eight.

Among theſe Bones alſo, ſome are ſooner united together than others. The *Oſſa Occipitis*, and *Maxillæ Inferioris*, are united together within the firſt Seven Years; but thoſe of the Head are not united till after a very old Age: When firſt the *Sagittal Suture*, next the *Lambdoides*, afterward the *Coronalis*, and laſt of all the *Squammoſæ*, are obliterated. For in very old Perſons, the *Sutures* will be united ſo cloſely by a Coalition, that there are ſcarce any Marks of them remaining; however the *Temporal Sutures* are always the laſt that are quite obliterated.

There is alſo a great Diverſity in the Poſition of the Bones, each Bone having its proper Poſition adapted by provident Nature

ture to the Conveniency of its Function; ſo that the Bones may be diſtinguiſh'd into *Superior* and *Inferior*, and into *Anterior* and *Poſterior*, in reference to their Poſition: And as to their Connexion or Union, that admits alſo of a great Diverſity; to wit, according as their Articulation is to be ſubſervient to a manifeſt, or to an obſcure Motion, or to the Strength and Stability of the Parts.

In reſpect to their Senſation, there is no remarkable Difference betwixt the Bones: The Teeth being the only that are ſenſible, all the reſt are void of Senſation, if you take the Bone without the *Perioſteum*, which elſe may be ſaid to communicate ſome Senſe to them. And after all, the Teeth themſelves have no Senſation of their own, but only what they borrow from that Membrane, which inveſts their Internal Cavity. For as all the other Bones are cover'd on their Exterior Surface with a Membrane, which for that Reaſon is call'd the *Perioſteum*; ſo the Teeth are inveſted on the Inſide with a very thin Membrane, which imparts to them a moſt exquiſite Senſe.

The Bones differ alſo in reſpect of the different Time of their Generation; for ſome of them are generated whilſt the *Fœtus* is as yet in the Womb; as the Bones of the Head, the *Femer*, the *Tibia*, the *Cubitus*, *Radius*, and moſt of the reſt. Some don't till after the Child is born; as the Bones of the *Carpus*, and of the *Pedium*. The Teeth alſo don't appear till after the Birth of the Infant, and among theſe ſome come ſooner, others later; and ſome of them even not till in an advanc'd Age, as theſe which they call the *Teeth of Wiſdom*. Among theſe alſo that have their firſt Origin in the Womb, ſome are brought into the World in their Perfection; as the Three ſmall Bones of Hearing; all the reſt come forth imperfect, being as yet deſtitute either of their Proceſſes, ſome *Sinus's*, or ſome other Thing apertaining to them.

CHAP. II.

Of the Parts of the Bones, together with an Explanation of their Names, ſuch as are frequently mention'd in the Hiſtory of the Bones.

NOtwithſtanding that the Bones (as we have ſhewn before) are *ſimple Parts*, and therefore require no peculiar Figure, which belongs only to the Organtick Parts; nevertheleſs as they are uſeful, and ſerve to the Motion of the Body, and the Support of the ſofter Parts, they have receiv'd divers Parts, and a peculiar Form. For were it not for the Articulation and Conjunction of the Bones, there would be no Motion in the Animal; and if they had no Protuberancies nor Subſidencies, there could be no Originations, Form, or Inſertions into them. Hence it is, that provident Nature has thought fit to frame the Bones in ſuch a manner, as that in ſome Places they ſhould riſe up in the nature of ſmall Hillocks, and in others ſhould be hollowed out like ſmall Vallies. And there being no ſmall Variety and Diverſity betwixt theſe Prominencies and Cavities, (each of which have their peculiar Names) we judged it abſolutely neceſſary to treat of them here in general, by way of Introduction to the enſuing particular *Hiſtory of the Bones*.

The Bones that are provided with theſe Prominencies and Cavities, are not always of one Sort; for ſome are the principal Parts of the Bones, and ſome are Parts that are only join'd to them. I call the *principal Part*, that which is the principal Bone, formed as ſuch by Nature, the hardeſt Part of all, and which is ſituated in the middle of the *adnate or conjoin'd Parts*. By the *adnate Parts*

Parts, I underſtand that which is by Nature united to the *principal Bone*, for its Elongation. The firſt is commonly call'd the *Bone*; the other is by the *Greeks* call'd an *Epiphyſis*, and by the *Latins*, an *Appendix*, or *Appendage*; which is the Name it ſhall be mention'd by in the enſuing Treatiſe. If you are deſirous to be ſatisfy'd concerning their natural Conſtitution, take one of the large Bones, ſuch as of the *Femur* or *Humerus* of a Calf, Lamb, or any other young Animal; boil it well, and clear it of the Fleſh; which done, rub it pretty hard with your Hand, and you will find that Part of the Bone which is call'd the *Appendix*, to come off from the reſt immediately.

The *Epiphyſes* are actually Bones as well as the reſt, but not quite ſo hard as the *principal Bones*, their Subſtance being not ſo ſolid, but full of ſmall Cells or Caverns, and ſpongious like a Pumice Stone. Neither have they any ſuch large Cavities as the other Bones, but ſerve rather to ſtop up the Cavities of the principal Bones, which is fill'd up with Marrow. Whence *Galen* has call'd all theſe *Appendages*, the *Couverts* of thoſe Bones that contain the Marrow. However in proceſs of Time, as the Body grows more aged, they are by the Heat and Motion indurated to ſuch a degree, that there appears ſcarce any, or at leaſt a very ſmall Difference betwixt them and the other Part of the Bone. For, Nature ſeems in the Formation of theſe *Appendages*, to give us a moſt peculiar Inſtance of her Providence. For ſince the whole Bone could not be all over *Principal*, or one very hard, dry and ſolid Bone, becauſe it would have been too weighty, and conſequently inſtead of being ſubſervient to the Motion of the Animal, would have proved an Impediment to it; and yet at the ſame Time, it could not conſiſt of ſuch a ſoft and ſpongious Subſtance as the *Epiphyſes* are; becauſe it would have prov'd inſufficient for its Functions, and been ſubject to Fractures. Nature has been very careful in making a peculiar Contrivance, ſo as to frame the middle Part of the Bone of a hard and ſolid, but the Extremities of a more ſoft and thinner Subſtance.

'Tis very well known, that the greateſt Danger of a Fracture is always in the middle Part of the Bone. To obviate this, the Bone muſt either be hardeſt or thickeſt in that Part; but becauſe it could not be form'd thicker without a remarkable Inconveniency, Nature thought fit to make it the harder in the Middle, and at the ſame time to join the *Epiphyſes* to all the larger Bones. Neither was this the only Reaſon why theſe *Epiphyſes* were thus fram'd; they being deſign'd alſo to further the Articulations of the Bones by their ſoftiſh Subſtance, at the Extremities of the Bones; as alſo, the Originations and Inſertions of the Muſcles, which being carneous, are conſequently ſoft. For, the Articulations could not ſo conveniently have admitted of very ſolid Parts, becauſe two ſolid Bodies, if join'd and mov'd together, muſt needs ſuffer an Attrition; neither is a very ſoft Subſtance ſafely to be united with a very hard One, becauſe the firſt will be impair'd by the laſt: For which Reaſon it is alſo, that the leſſer Bones have their *Epiphyſes*, as well as the large Ones: So that all the Bones that were to have a manifeſt Motion or Articulation, have their *Epiphyſes* annex'd to them; and this Connexion, or Union, is not made upon a ſmooth and equal Surface; For, if it had been ſo, they would have been very apt to tear aſunder; but by means of certain Inequalities or Prominencies, which are conjoin'd with the *Sinus's* of other Bones, this Union is ſo very weak in Infants and Children, that they may eaſily be ſeparated from the Bones, without any previous Coction or Putrefaction.

All the Bones, whether they be *Appendages* or *principal* Bones, have either a ſmooth and even Surface, or an uneven and protuberating in ſome Places; and with certain Pits, Cavities, or *Sinus's*. The Protuberancy of a Bone, call'd by the *Greeks Apophyſis*, and in *Latin Proceſſus*, a *Proceſs*, is that Part of a Bone which riſes into a Protuberancy above its Surface. Moſt all the Bones are provided with theſe Proceſſes; but eſpecially the *Vertebra*; each of which has ſeveral of them; as alſo the *Inferior Maxilla*, which has on each Side two conſiderable Proceſſes. A *Sinus*, is a Pit or Cavity within the Surface of the Bone, as that in the *Os Coxendicis*, the *Scapula*, &c. There are many different Sorts, as well of the Proceſſes as of the *Sinus's*, but eſpecially of the Proceſſes; ſome

being pointed and ſlender, others round. The *pointed* Proceſs call'd the *Collum*, or *Cervix*, the *Neck*, is a ſharp and longiſh Protuberancy. This *Neck* is alſo of two different Sorts; for ſome have a broad *Baſis*, but terminate in a pointed Head, call'd *Corone* by the *Greeks*, and the *pointed Neck*, or *Proceſs* according to the *Latin*; which are ſubdivided again into different Sorts: For that which is like unto a Style, is call'd, the *Styloides*; that which reſembles unto the Breaſts, the *Maſtoides*; that which bears a Reſemblance to the Bill of a Raven, the *Caracoides*: But others have a broad Extremity which forms the Head of the Joint; as that of the *Femur*, which is articulated with the *Os Coxendicis*; or alſo makes a *Sinus*, as the Neck of the *Scapula*. Theſe Proceſſes which have a very conſpicuous round Protuberancy, are call'd the *Heads*, and are thoſe Proceſſes, which enter into the Cavity of another Bone for their Articulation. Theſe Heads are either Oblong and Thick, or Prominent, ſuch as the Head of the *Femur* is; or elſe flat, as the Heads of the Fingers; theſe laſt are by the *Greeks* call'd *Condyli*; for the *Latins* have no peculiar Words for them.

A *Sinus*, is a Cavity which receives a *Head*: And as there are two Sorts of Heads, ſo the *Sinus's* may be divided alſo into two Sorts: For that Sort which is very deep, and receives a large *Head*, is call'd *Cotyla*, or *Acetabulum*: Such is the *Sinus Coxendicis*, which receives the Head of the *Femur*. But the other, which is Flat and Superficial, and anſwerable to a flat Head or a *Condylus*, is call'd *Glene*. Such are thoſe in the Bones of the *Tarſus*, where they are articulated with the Bones of the *Metatarſus*, and in the Bones of the *Carpus*, where they are joined with thoſe of the *Metacarpus*; ſo that the *Cotyla* is a very remarkable *Sinus*; but the *Glene* is ſo very obſcure, that it ſeems doubtful whether it ought to be number'd among the *Sinus's* or not. On the Extremities or Edges of the *Sinus's* there are certain Proceſſes like Lips, which are very conſpicuous on the deep *Sinns's*, call'd *Labra* and *Supercilia* by the *Latins*, *i. e.* the *Bones* and *Lips* of the *Sinus*.

CHAP. III.

Of the Structure and mutual Connexion of the Bones.

NAture, the common Parent of all created Beings, has not only compoſed the Fabrick of the humane Body of many Bones, but alſo provided them with proper Articulations for their more convenient Motion. This Frame or Compoſition of the Bones is by the Greeks call'd a *Skeleton*, and their mutual Connexion *Arthron*, in *Latin*, *Articulus*, a Joint; though this Word has no leſs than Five different Acceptations: For, (1.) *Arthron* is call'd by the *Greeks*, in a *general Signification*, every Connexion of the Extremities of the Bones; whether by a Head, or *Sinus*, as in a *Diarthroſis*, or whether by certain Inequalities, as by the Sutures. (2.) In a *more ſtrict* Senſe, it is taken only for that Extremity which has a round Head, and is inſerted into a Cavity. (3.) Sometimes it is taken for the Articulation of the Bones it ſelf: And, (4.) In a more *ſtrict* Signification, for that only which has a manifeſt Motion. (5.) The Phyſicians oftentimes alſo take it for the Place adjoining to the Joint, becauſe they call the *Pains of the Joints*, (which have not their Seat in the *Joints*, but only in the Places next adjoining to them, to wit, in the Tendons, carneous, nervous, and membranous Parts) the *Arthritis*, and *Arthritick* Pains.

But to come to the Connexion of the Bones: Some of them are *continuous*, others *contiguous*, or, as the *Greeks* expreſs it, ſome of theſe Connexions are made by *Symphyſis*, or by Coalition, or by *Arthron*, or *Arthrodia*, *i. e.* by Articulation; for the Connexion of the Bones is ſuch in ſome of them as not to be diſcovered by our Senſes; ſo that, to all Appearance, they ſeem to be rather one than two Bones; and this is their Connexion by *Symphyſis*: But in ſome others this

this Conjunction is not ſo cloſe; but that they remain two diſtinct Bones, being only contiguous to one another, and appearing as ſuch to the Eye; whereas thoſe that are united by a *Symphyſis*, or a Continuity, are inſeparable without making a Fracture

There are Two Sorts of this Union; the *firſt*, is that which is ſaid to be when Two diſtinct Parts are united without the Intervention of any *Medium*; and the *ſecond*, when this Union is made by ſome intervening heterogeneous Subſtance: The firſt is called the true *Symphyſis*, and the laſt the *ſpurious*. Of the firſt Kind, you may make your Obſervation in the *inferior Maxilla*, which conſiſting of two Bones, conjoined by a *Synchondroſis*, degenerates into one Bone; the Cartilage by which it was conjoin'd turning altogether oſſeous to ſuch a Degree, that it leaves not the leaſt Mark behind it; ſo that whereas in a new-born Child, the Two Bones of the *Maxilla* were conjoin'd by a *Symphyſis*, (*improperly* ſo called) they are afterward united by a *true* One after the Cartilage diſappears.

In the ſame Manner there are almoſt innumerable *Appendages* in the Bones of new-born Infants, which are conjoin'd by *Synchondroſis*, and by *Syneuroſis*, which afterward, when their intermediate Part by which they were conjoin'd, diſappears, and turns into an oſſeous Subſtance, are conglutinated with the Bones by the *firſt* and *true* Species of the *Symphyſis*. Thus each of the infantile *Vertebræ* conſiſt of Three ſmall Bones, which being conjoin'd by an intermediate Cartilage, afterwards make but one continued Bone. The ſame Thing is obſervable in the *Oſſa Innominata*, and in the *Sternum*.

And here let us not paſs by in Silence the Reaſon aſſigned by *Galen* (*Lib. de Offib.*) for this Diverſity of the *Symphyſis*: For, (ſays he) 'Soft and ſpongious Bones are of 'an eaſy Coalition, and may ſoon be united in ſuch a Manner, as to make but one; 'but thoſe that are very ſolid and compact 'require a *Medium*, by the Means of which 'they may be united together. For ſuch 'Things as are very different in their own 'Nature, as that which is *hard*, and that 'which is *ſoft*, cannot be united without 'the Intervention of ſome *Medium*; for 'two ſoft Subſtances will eaſily join together, but two hard Things never, without ſome intermedious Body, that may be able to join them both together: And thus it is alſo with the Bones.

Now, this intermediate Body or Subſtance being of Three Sorts; to wit, a *Cartilage*, a *Nerve*, or *Fleſh*; from thence ariſe alſo Three different Kinds of the *Symphyſis*; to wit, the *Synchondroſis*, *Syneuroſis*, and *Syſarcoſis*; but becauſe no Bone is conjoin'd with another by an intermediate Nerve, (properly ſpeaking) I leave out the *Syneuroſis*, and inſtead thereof, place Two others, which I call the *Syndeſmoſis* and the *Syntenoſis*; theſe Two Words ſeeming to be moſt proper, and adapted to their own Nature: Unto which I add another Kind; to wit, the *Synemoſis*; ſo that, according to the Five Sorts of the intermediate Bodies, I make alſo Five Kinds of the *Symphyſis*; to wit, the *Synchondroſis*, the *Syſarcoſis*, *Syndeſmoſis*, *Syntenoſis*, and *Synemoſis*. The *Synchondroſis* is a continued Union of the Bone, made by an intermediate Cartilage, which unites both the Bones together. Thus the Bones of the *Inferior Maxilla* are conjoin'd in young Infants, and the Bones of the *Pubes* in Adults: For in the Middle of the *Pecten* is a Cartilage, which joins both the Bones together, which is very conſpicuous, if you diſſect the *Oſſa Pubis* lengthways.

Syſarcoſis, a *Concarnation*, is an Union made by the Means of intermediate Fleſh. In this Manner (generally ſpeaking) all the Joints that are inveſted with Muſcles are conjoin'd: For ſince for the moſt part they have their Originations in one Bone, and their Inſertions in the other, they are look'd upon to ſerve inſtead of Ligaments, by which the Bones are faſten'd together. This Connexion is call'd *Syſarcoſis*, becauſe moſt of the Ancients have given the Name of *Fleſh* to the Muſcles.

The *Syndeſmoſis* is when this Connexion is performed by the Help of a Ligament. This is either *broad*, and incloſes the whole Joint, ſo as to ariſe from one Bone, and to have its Inſertion into the other, ſuch as is in moſt Articulations of the Joints, and is obſervable in that of the *Os Femoris* with the *Coxendix*, aud of the *Os Humeri* with the *Scapula*; or elſe *round*, like a very

ſtrong Tendon, being peculiar only to the great Bones, to keep them within their *Sinus's*. Thus it is in both the Heads of the *Femur*, both in that which on the ſuperior Part is articulated with the Cavity of the *Coxendix*, and in that *doubled Head* which is articulated with the *Tibia*; ſo that ſome Bones are articulated by a double *Syndeſinoſis*, as the Joints of the *Femur*; others, only by a ſingle One, as the Fingers.

A *Syntenoſis*, is call'd that Sort of Union which is made by a Tendon: Thus the *Patella* is join'd with the *Femur* and *Tibia*; thus the ſmall Bones, call'd the *Seſamoidea*, are articulated with the Bones of the Fingers, becauſe they are faſten'd to them by a Tendon.

The laſt Sort is the *Synemoſis*, which Connexion is made by an intermediate Membrane. This Connexion is obſervable in the Bones of the *Sinciput* with the *Os Frontis* in new-born Infants. Thoſe Bones that are contiguous only, are join'd together by *Arthrodia*. This Articulation is either *Looſe* or *Laxe*, or elſe *Strait* and *Compact*. That which is *Laxe*, is ſubdivided again into ſuch as has a *Manifeſt Motion*; or elſe ſuch as has either none at all, or at leaſt no Evident Motion; from whence ariſe Three different Sorts. The *Firſt*, which is *Strait* and *Compact*, is call'd *Synarthroſis*, or *Coarticulation*: The *Second*, which is *Laxe*, and has a *Manifeſt Motion*, is call'd *Diarthroſis*, or *Perarticulation*: And the *Third*, which is *Laxe* alſo, but without any, or at leaſt without a *Manifeſt Motion*, is call'd *Neutra*, or the *Neuter*; becauſe, in Reſpect to its Connexion, it is a *Diarthroſis*; but in Reference to its Want of Motion, it approaches to the Nature of a *Synarthroſis*, and might improperly be call'd a Spurious *Diarthroſis*.

Of the *Diarthroſis*, there are Three Kinds, *Enarthroſis*, *Arthrodia*, and *Ginglymus*. *Enarthroſis*, is when a deep Cavity receives a round and large Head; ſuch is the Articulation of the *Os Femoris* with the *Os Iſchium*.

Arthrodia, is when a flat Head is articulated with a ſuperficial, or leſs deep Cavity; ſuch is the Articulation of the Head with the Firſt *Vertebra*, of the *Radius* with the *Humerus*, and of the Fingers with one another.

Ginglymus, is when one and the ſame Bone receives, and is receiv'd; as when the convex Part of a Bone enters the concave Part of another; and again, when the *Sinus* of the ſame Bone receives the convex Part of another: Thus it is in the mutual Articulations of the *Vertebra*.

Of the *Neuter*, or ſpurious Kind of *Diarthroſis*, there are alſo Three Kinds; which have alſo the ſame Names with the former.

1. *Enarthroſis*, which has a round Head, and a deep Cavity, or *Sinus*; but it is deſtitute of Motion; ſuch is the Bone of the *Talus* with the *Os Naviculare*.

2. *Arthrodia*, which has a flat Head, and a ſuperficial *Sinus*; as the Bones of the *Tarſus* with one another.

3. The *Ginglymus*, when the Cavity of one Bone receives the convex Part or Protuberancy of another; and contrarywiſe. This Kind of Articulation is obſervable in the ſmall Bones of Hearing, which are actually mutually conjoin'd, but have no manifeſt Motion.

The *Synarthroſis* is diſtinguiſh'd alſo into Three Sorts; to wit, the *Suture*, *Harmonia*, and *Gomphoſis*.

A *Suture*, is a Connexion form'd after the ſame Manner as Things are ſew'd together, or preſs'd, compact upon one another. Thoſe *Sutures* that are like Things ſew'd together, are call'd, the *Noble*, or the *True Sutures*; to wit, the *Coronalis Sagittalis*, and the *Lambdoides*, which conjoin the Bones of the *Frons*, the *Vertex*, or *Sinciput*, and of the *Occiput*. But to the *Compact Sutures* belong the *Suturæ Temporum*, call'd *Squammoſæ*, or like *Scales*. And here it is to be obſerv'd, that ſome Authors alſo make Uſe of the Word *Suture*, when they ſpeak of the Second *Species* of the *Synarthroſis*, which is call'd *Harmonia*; becauſe they give the Name of *Sutures* to ſeveral of the *Harmonia's* of the Head.

Harmonia is a Conjunction, when the Bones which are conjoin'd are articulated in ſo exact and equal a Line, as not to emit, or inſert, the leaſt Inequalities one within another. 'Tis by this Articulation, that the Bones of the *Maxilla Superior*, and moſt of thoſe belonging to the Noſe, the *Os Sphænoides*, *Cribroſum*,

broſum, &c. are join'd together: But it is very ſeldom, that ſuch an exact *Harmonia* is to be obſerv'd in the Articulation of the Bones; for they have generally ſome Inequalities at their Extremities; whence it is, that the *Harmonia* is by the moſt exact Anatomiſts plac'd among the *Sutures*; but ſo as to be a *Suture* improperly ſo call'd.

Gomphoſis, which is the Third Kind of the *Synarthroſis*, has obtain'd its Denomination from a Nail, becauſe here one Bone is drove or fix'd into another Bone, like a Nail into the Wood. Thus the Teeth are fix'd within the *Alveoli* of the Jawbones, which are the only in the whole Skeleton that belong to this Kind of Articulation.

Theſe are the ſeveral Ways by which the Connexions of the Bones with one another are accompliſh'd: But among all theſe, that Kind of Articulation, which is deſign'd for the Motion of the Body, being the moſt noble, Nature has for that Reaſon thought fit to render it the more perfect, by the Variety that is to be obſerv'd in its Compoſition: For beſides the Bones which make up this Connexion, there are alſo ſome other Things which contribute towards its Accompliſhment; to wit, the *Ligaments*, and a certain unctuous, thick, white, and pituitous Humour.

The *Ligament* is diſtinguiſh'd into Two Sorts; one broad, and the other round; as has been mention'd before, and will be ſhewn more at large hereafter.

The *White*, *Tenacious*, and *Glutinous* Humour, is contain'd within the Interſtices, where the Extremities of the Bones meet, and are articulated together, call'd commonly the *Humour of the Joints*. Its Quantity varies according to the Magnitude of the Joint; for the great Ones contain a greater, and the ſmaller, a leſs Quantity; tho' ſometimes alſo, it either increaſes or decreaſes, according to the different præternatural Cauſes: For if there be a plentiful Supply of a pituitous Humour, or if the Joints are very weak, ſo that they can't apply all their Nouriſhment, nor expel all the Remainder, it will be found in a conſiderable Quantity. As on the other Hand, it will prove defective, after long continu'd Fevers, moſt violent Exerciſes, and Abſtinency from Food for ſeveral Days. 'Tis alſo more plentiful in young People than in old. Sometimes it contracts alſo a malignant Quality, and occaſions very violent Pains: And if it degenerates into a præternatural State, be it in what Manner it will, but much more if it be quite defective, it impairs the Motion of the Joint; as I have often obſerv'd by my own Experience, when a Tumour has ariſen about the Joints, which turning into an Abſceſs, and being open'd, this Humour has been quite evacuated. For nothing is more common among unskilful Chirurgeons, than to miſtake it for a purulent Matter, and conſequently to do all they can to further its Evacuation, till at once they rob the Joint of its natural Humour and Motion.

CHAP. IV.

Of the Nutrition and Nutriment of the Bones, and by what Ways it is convey'd to them.

THE Bones, according to *Ariſtotle* (2. *de Part. Animal.* 6.) are nouriſh'd by the Blood. But on the contrary, *Hippocrates* (*Lib. de Aliment.*) ſays, That *the Marrow is the Nutriment of the Bones*: And *Galen* (*L.* 11. *de Uſu Part. Cap.* 18.) *the Marrow is the proper Nouriſhment of the Bones*; and, (*Lib.* 3. *de Nat. Facult. Cap. ult.*) *the Marrow is the ſame Thing to the Bones, what the Blood is to the Fleſh.* In Relation to this Controverſy, I can't but ſide with *Ariſtotle* againſt *Galen*; becauſe there are many, and thoſe very weighty Reaſons, which may convince us, that the Marrow can't be the proper Aliment of the Bones.

For,

For it is not probable, that Nature ſhould have deſigned the Marrow to be a Nutriment to the Bones, and at the ſame time have made it quite unfit for their Nutrition, by giving it a Temperament quite oppoſite to that of the Bones; to wit, a *hot* and *moiſt*; whereas the Bones, on the contrary, are of a cold and dry Temperature. Beſides, that the Marrow being a Kind of Fat, is rather to be number'd among the uſeful Excrements, than a fit Nutriment of the Body. And if we will make the Marrow the proper Nutriment of the Bones, all the Bones muſt of Neceſſity contain ſome Marrow: But all the Bones are not provided with it, as the ſmall Ones.

On the other Hand, there is no Animal that has Bones, but what is provided alſo with Blood; whereas all the Animals that have Bones, are not provided with Marrow; as the *Lion*; which ſeems to ſhew, that the Bones are nouriſhed by the Blood, and not by the Marrow. 'Tis true, *Realdus Columbus* will not allow the Bones of the Lion to be ſolid; but ſays, That they contain a Marrow; becauſe he had ſeen ſome Lions Bones at *Florence*, which had very large Cavities. But *Columbus*'s Argument will not bear the Teſt: For allowing the Bones of the Lion to have large Cavities, it does not follow, that they were made for the Marrow's Sake; but rather to prevent the Bones from being too weighty: Beſides that, ſometimes we obſerve but a ſlender Quantity of Marrow in very conſiderable Cavities; as in the Bones of a Mutton, there is but little Marrow, in Proportion to their Cavities. And this makes *Ariſtotle* affirm, not without good Reaſon, That though the Marrow is found no where elſe but in the Bones, therefore no Inference is to be made, that all the Bones contain a Marrow within them, but thoſe only that have their interior Cavities; and even not all of them neither. He alledges as an Inſtance, the Lion's Bones, which he ſays have partly no Marrow, partly but a ſmall Quantity of it; and therefore have by ſome been thought to be quite deſtitute of Marrow.

Perhaps the Queſtion will be ask'd me, Whether, ſince the Marrow is not allowed to be the proper Nouriſhment of the Bones, it be quite uſeleſs? And if not, What Uſe it was deſigned for? This Queſtion is ſoon anſwer'd; for the Bones being in perpetual Motion, and naturally of a dry Conſtitution, it was requiſite they ſhould be moiſtened without Intermiſſion; and the Marrow is excellently well qualified for that Uſe.

Suppoſing then the Bones to be nouriſhed by the Blood, there ariſes another Queſtion: By what Ways or Channels the Blood is conveyed to the Bones? I ſay, by the Veins; which have made certain Holes for their Paſſage, and the Supplies of the Aliment, in the Subſtance even of the hardeſt Bones; as is evident in the *Cranium*, the *Femur*, and the *Tibia*.

+ arteries.

CHAP. V.

Contains a ſhort Enumeration and Diſtinction of the Bones.

NOW we are juſt upon the Point of Beginning the particular Hiſtory of the Bones, we will ſay ſomething alſo concerning their Number; and this is not to be underſtood of the Body of young Infants, but of adult Perſons, and ſuch as are come to their full Perfection.

The whole Frame of the Bones therefore we will diſtinguiſh into Four Parts; to wit, the *Head*; the *Thorax*, or the *Cheſt*; the *lower Venter*, or the *Belly*; and the *Limbs*.

The Head is call'd all that Part which is placed above the *Vertebræ* of the Neck, and is ſubdivided into the *Cranium*, or Skull, and the Face, or the Two *Maxilla's*. The Skull, is call'd that Part which covers the Brain on the ſuperior Part, and is it ſelf covered with Hairs. This in adult Perſons conſiſts

conſiſts moſt commonly of Fourteen Bones, ſome of which are peculiar to it, and others it has in common with the ſuperior Jaw. Its proper Bones are, the *Os Frontis*; Two Bones of the *Synciput*; One of the *Occiput*; Two of the *Tempora*; Six Bones dedicated to Hearing; to wit, Three in each Ear, *viz.* the *Malleus*, *Incus*, and *Stapes*. Of thoſe it has in common with the ſuperior *Maxilla*, there are Two; to wit, the *Os Cunciforme* and the *Spongioſum*. There are Two *Maxilla's*, *viz.* the Superior and the Inferior: the Superior has, beſides the Two it has in common with the *Cranium*, Six on each Side belonging peculiarly to it; but the Inferior conſiſts only of one Bone. Both theſe *Maxilla's* are provided with Teeth, of which there are Two and thirty in adult Perſons; to wit, Sixteen in each Jaw. Among theſe, Four are called *Inciſores*, or the *Cutters*; Two *Canini*, or the *Dog-Teeth*; and Ten *Molares*, or *Grinders*.

The *Thorax* is divided into the *Anterior*, the Two *Lateral*, and the *Poſterior* Part. The *Anterior* Part contains the Two *Clavicles* and the *Sternum*, which conſiſts of Three Bones in adult Perſons: The *Lateral* Parts comprehend the Ribs, Twelve on each Side: The *Poſterior* Part, the Two *Scapulæ*, and Twelve *Vertebræ*. To the *Thorax* belongs alſo the Neck, which conſiſts of Seven *Vertebræ*, and of the *Os Hyoides*, which is ſituated at the Root of the Tongue at the ſuperior Part of the *Larynx*, and moſt commonly conſiſts of Eleven Bones.

The lowermoſt Region or *Venter*, has in its *anterior* Part the Two Bones of the *Pubes*; in its *lateral* Parts, the *Oſſa Ilium & Coxendicis*; and in its *poſterior* Part, five *Vertebræ* of the Loins, Six Bones belonging to the *Os Sacrum*, and Four to the *Coccyx*.

The Limbs are divided into the *Hands* and the *Feet*; and the *Hand* is ſubdivided into the *Humerus*, the *Cubitus*, and the Hand, properly ſo called.

The *Humerus* is but One ſingle Bone; but the *Cubitus* has Two, *viz.* the *Radius* and the *Ulna*. The *Hand*, properly ſo called, comprehends the *Carpus*, *Metacarpus*, and the Fingers.

The *Carpus*, or Wriſt, conſiſts of Eight Bones, placed in Two diſtinct Rows: The *Metacarpus* has Four Bones.

The *Fingers* are Five in Number; each of which conſiſting of Three Bones, this makes Fifteen in all: Beſides which, there are Twelve other very ſmall Bones, call'd *Seſamoidea*, from their Reſemblance to the *Semen Seſami*.

The Foot is alſo diſtinguiſh'd into Three Parts; to wit, the *Femur*, the *Tibia*, and the *Foot* properly ſo called.

The *Femur*, or the Thigh-Bone, conſiſts only of One.

The *Tibia*, or the Leg, is compoſed of Two; to wit, the *Tibia* and *Fibula*.

The *Foot*, properly ſo called, is divided into the *Tarſus*, the *Metatarſus*, and the Toes.

The *Tarſus* conſiſts of Seven Bones; the *Metatarſus* of Five; the Toes of Fourteen; beſides the Twelve *Seſamoidea*, and the *Patella*, which is plac'd juſt before the *Femur* and the *Tibia*.

This is the whole Number of Bones belonging to the humane Body, which by an exact Computation, ſtand thus: The *Head* has *Fifty nine*; the *Thorax*, *Sixty one*; the *lowermoſt Region*, or the *Belly*, *Twenty one*; each *Hand*, *Forty two*; each *Foot*, the ſame Number; and conſequently both the *Hands* and *Feet* have *One hundred and ſixty eight*: And the Sum Total of the *humane Body* amounts to no leſs than *Three hundred and nine*.

OF THE

ANATOMY

OF

Humane Bodies;

Its DIVISION, and PARTS in General.

Taken out of Monſieur de St. Hilaire.

BY the Word *Anatomy*, is to be underſtood, that Art which teaches us the true Method how to make the Diſſections of all the Parts that compoſe the humane Body, in order to expoſe to our View every Thing belonging to them, and diſcoverable by our Senſes. It is divided into Two Parts, *viz.* into the *Oſteology* and the *Sarcology*. The Firſt treats of the Bones and Cartilages, and the Laſt is ſubdivided again into Three Parts, *viz.* The *Splanchnology*, which comprehends the Hiſtory of the Internal Parts, and more particularly of the *Viſcera*; the *Myology*, or Doctrine of the Muſcles, and the *Angejology*, which treats of the Veſſels, *viz.* The Nerves, Arteries, Veins, and the *Lymphatick* Veſſels.

The chief Subject of *Anatomy*, is the humane Body, for Three Reaſons: (1.) As being the Maſterpiece of Nature, and conſequently the moſt perfect of all others. (2.) Becauſe nothing being of greater Moment to a Man than the Knowledge of his own ſelf, nothing can be of greater Conſequence to him, than to be well informed concerning the Condition of his own Body. (3.) Becauſe the Practical Part of Anatomy is ſo abſolutely neceſſary to Phyſitians, as well as Chirurgeons, that they can't neglect it, without renouncing abſolutely to their Profeſſion, whereof it is the very *Baſis* and Foundation-Stone, it being next to an Impoſſibility they ſhould be capable of curing a Diſtemper, or perform any Manual Operation, without being firſt acquainted with the Natural Condition of the affected Part.

The

The humane Body may be conſidered either in *General* or in *Particular*.

If it be conſidered in *General*, i. e. taken altogether, you may obſerve in it a great Variety, either in relation to its exterior Form, or to its Bulk, or its Colour.

If you conſider it in *Particular*, i. e. in reſpect to each of its Parts, you will meet here with an agreeable Figure, and exact Proportion of all its Parts; a Subſtance peculiar to themſelves, a moſt excellent Union, a moſt admirable Structure, and in their reſpective *Functions* and Uſes, a great Variety; but ſo excellently well contrived, as not in the leaſt to impair or diſturb the true Harmony, and agreeable Conveniencies of theſe Parts.

Thus in a Natural State, the Head is of a Bigneſs proportionable to the reſt of the Body, tho' rather ſomewhat larger than leſſer, of an Oval Figure, flattiſh on both Sides, but riſing before and behind, being neither exactly round, nor pointed. The Forehead is broad, and the Features of the Face are large, eſpecially in Men, who ought not to be very ſolicitous about Beauty. The Neck is long, and not too thick. The Breaſt or Cheſt, large, broad and high, to afford a ſufficient Space to the Heart and Lungs, to perform their Motions without any Impediment: The Breaſts in Men, are not ſo plump and riſing as in Women and Maids; the Belly is ſomewhat riſing and roundiſh; the *Spina* is ſtreight; the Hips are ſomewhat large, and the Haunches a little riſing; the Thighs round and brawny; the Joints large; the Legs ſomewhat thick and well turn'd; the Foot broad, and the Arm fleſhy, but not too long, bearing a due Proportion to the Body; and above all, here the Veins and Muſcles are moſt Conſpicuous; and laſt of all, the Hands are ſtrong, to fit them for Labour.

Each Part of our Body (without Exception) is a Corporeal Subſtance united in Continuity to the whole, incloſed within certain Limits peculiar to it ſelf, ſerving in conjunction with the others to accompliſh the *whole*, and deſign'd for certain Functions and certain Uſes.

This *Definition*, according to *Diemerbroeck*, is very perfect; for, *Firſt* of all, each Part of our humane Body muſt be a Corporeal Subſtance, join'd to the whole in a Continuity, but not in a Contiguity: For contiguous Bodies are ſuch, as of Neceſſity are different from one another, and which may be ſeparated without undergoing an Alteration, each of them remaining entire what it was before. Thus, as it cannot be ſaid, That the Wine contain'd in a Veſſel, is a Part of that ſame Veſſel which contains it, nor the Veſſel to be a Part of the Wine which it is contain'd within, becauſe there is no Continuity betwixt them; ſo it can't be affirm'd, that the Blood which flows within the Arteries is a Part, either of the Artery, or of the humane Body, becauſe it is not united with it in Continuity.

Secondly; A *Part* ought, in Conjunction with others, to make up and perfect the *Whole*; for whatever is beyond, or does not appertain to its Perfection and Accompliſhment, ought not be remember'd amongſt its Parts, but muſt be conſidered as different Parts, each of which ſubſiſts by it ſelf, and ſuch as are oftentimes united to the Whole, in order to receive their Nouriſhment from thence. Thus an Infant or *Mola*, whilſt they are remaining within the Womb, are no Parts of the Body of the Woman, but ſubſiſt by themſelves, tho' at the ſame Time they are join'd to the *Matrix* or Womb, by means of the *Placenta* and the Umbilical Veſſels, by which they receive their Nouriſhment; and the Child-bearing Woman, after her Delivery, is as compleat a Woman as ſhe was before.

In the ſame manner, the *Sarcoma* and other ſuch-like Things are not reckon'd among the Parts of our humane Body, becauſe they neither contribute towards the Perfection *of the Whole*, neither are deſign'd for any neceſſary Functions and Uſes, but are join'd to the *Whole*, only to receive their Nouriſhment.

Thirdly; A Part ought to be ſo diſpos'd and deſign'd, as to ſerve to perform certain Functions and Uſes.

By the Word *Function* or *Action*, muſt be underſtood a certain Motion, tending to ſome Effect produced by ſome Organ, for its peculiar Advantages and Conveniencies.

Theſe *Functions* are either *Particular*, i. e. belonging to the Part itſelf; or *Publick*, i. e. belonging to the whole *Animal*. As for In-

ſtance, the Stomach by its *Action* or *Function* of *Digeſtion*, which is peculiar to it ſelf, converts the Blood convey'd thither by the *Arteries*, into a Subſtance altogether the ſame with itſelf, which ſerves for its Nouriſhment: But beſides this, it has alſo another *publick Function* or *Action*, viz. the *Chilification*, by which it provides for the whole Body.

The *Uſe* of a Part, is call'd a certain Diſpoſition or Aptitude belonging to that Part, to ſerve or conduce to a certain End; which muſt be ſuch, as not only to be Uſeful to that Part from whence it ariſes, but alſo to be beneficial either to ſome other, or to the whole, unto which it belongs. It is diſtinguiſh'd from the *Action* by two different Ways: Firſt, In that the *Action* does not belong but to ſuch Parts only as are capable of *Action*; whereas the *Uſe* often belongs to thoſe alſo that don't *act*; but yet are diſpoſed in ſuch a manner, as to be aiding and aſſiſting theſe *acting* Parts, to perform their Actions the better. Thus the *Epidermis* or *Cuticula* is deſtitute in itſelf of all manner of *Action*: But its *Uſe* is to moderate and qualifie the acute Senſe of the Skin, and to ſerve it for a Coavert, as well as to the Extremities of theſe Veſſels that terminate there, and to be a Defenſive to them againſt all External Injuries. Thus the Fat alſo has no *Action*, but nevertheleſs it preſerves the natural Heat of the Parts, and it moiſtens and procures them a more eaſie Motion. In the ſame manner the Hairs don't *act*, but their *Uſe* is to cover the Head, to ſerve it for an Ornament, and to defend it againſt the Cold.

Secondly, The *Action* belongs to every *Organ* that operates; but the *Uſe* to each of the Parts of this *Organ*. As for Inſtance; The *Action* of the Muſcle is to draw or pull, and the *Uſe* of its Membrane, to re-unite and keep its Fibres together; as alſo, to diſtinguiſh each particular Muſcle one from the other. The *Uſe* of the *Artery* in a Muſcle, is to convey thither the Blood; that of the Nerves, to communicate to it the animal Spirits; and that of the Fleſh, to ſupport and ſtrengthen the Fibres.

Notwithſtanding all this, the Anatomiſts frequently confound the *Uſe* with the *Action*, i.e. with the *Function*, and promiſcuouſly take one for the other: As on the other Hand, the *Action* of a Part is often call'd alſo the *Uſe*, becauſe it always tends to ſome certain End: And the *Uſe* is alſo oftentimes qualify'd with the Title of *Action*, becauſe it does not exclude the *Action*; yet in ſuch a manner, that the *Uſe* is much more extenſive than the *Action*.

The ſeveral Parts of the Bodies admit alſo of a *twofold Diſtinction*; (1.) In Reſpect to their *Subſtance*: And (2.) In Relation to their *Functions*. In Reſpect to their *Subſtance* they are ſubdivided into *ſimilar* and *diſſimilar* Parts.

The *ſimilar Parts*, are theſe that ſubdivide themſelves into other Parts, altogether like unto one another; ſo that all their Particles are of the ſame Nature and Subſtance. Thus each Part of a Bone, is boney; and of a Fibre, fibrous.

Of theſe, there are commonly reckon'd Ten; *viz.* The Bones, the Cartilages, the Ligaments, the Membranes, the Fibres, the Nerves, the Arteries, the Veins, the Fleſh, and the Skin.

Among *theſe Parts*, ſome are call'd *abſolutely Similar*, as the Bones, the Cartilages, the Fibres; in which, it is not eaſie to diſtinguiſh the Difference of their Particles by the Eye: (I ſay, not eaſie to be diſtinguiſh'd by the Eye; for in regard of their different Atoms and Elements, which make up a Part of them, which are the Object only of our Thoughts, and not of the Eyes, not any one of them can properly and actually be call'd a *ſimilar Part.*) All the others are *ſimilar*, in Reſpect only to our Senſes; becauſe in theſe, the difference of their Particles is apparent and obvious to the Eye; as in the *Veins*, the *Arteries* and *Nerves*. For a *Vein* is compoſed of very thin Fibres, and of a Membrane; an Artery, of Fibres and two different Membranes: A Nerve, of Fibrils, of a *Meninx* or Tunic, and of the Marrow; and nevertheleſs, theſe Parts are call'd *ſimilar*: But this muſt be taken in a very extenſive Signification, and only upon this Account, becauſe their Compoſition is every where the ſame, which makes them to be alike to themſelves in all Reſpects, there being (as for inſtance) not the leaſt difference in their Subſtance whilſt contain'd within

the Head, from that which is to be obſerv'd in them in the Feet, and other Parts.

It was a receiv'd Opinion in former Ages, That theſe Parts were to be diſtinguiſh'd into *ſpermatick*, *ſanguine* and *mix'd* Parts. They call'd thoſe *ſpermatick Parts*, which, as they imagin'd, contain'd more of the Seed than of the Blood; as in the Ten firſt: And they call'd thoſe *ſanguine Parts*, where they ſuppoſed the Blood to predominate, as in the *Fleſh:* And they gave the Name of *mix'd Parts* to thoſe, wherein, according to their Suppoſition, there was an equal Mixture of *Seed* and *Blood*. But our Modern Authors, upon a ſtrict Enquiry, have found, that theſe Parts are altogether *Spermatick*, becauſe they are all extant in the *Ovum*; as will be ſhewn hereafter.

'Tis to be obſerv'd concerning the *ſpermatick* Parts, that wherever they are once abſolutely loſt, or cut away, they can never be reſtor'd or regenerated; and if they happen to be ſeparated or broken, they can't be re-united without the intervention of ſome Heterogeneous Body. Thus, if a Bone be taken off by Amputation, it is not to be reſtor'd again; but if broken only, the Parts may be re-united, or conſolidated, by the Means or Intervention of a *Callous* Subſtance. The *ſanguine* Parts grow afreſh again; as may be ſeen in the Fleſh, if part of it be cut away, or a ſeparation be made by a Wound. The *mix'd* Parts keep a *medium* betwixt both.

There are nevertheleſs ſome who are doubtful as to the *ſpermatick Parts*, as they are call'd, whether after they are broken or bruiſed they are to be conſolidated or re-united in all Bodies, without Exception, by the Intervention of a Heterogeneous Subſtance; being of Opinion, that in young Infants, in whom theſe Parts, and even the Bones themſelves, are very ſoft, they may be re-united by the means of a Homogeneous Subſtance. But as in Children, the Wounds made in the Skin, and the Fractures of the Bones, are never heal'd and join'd again, without leaving a Scar in the Skin, and a *Callus* on the Bone. It ſeems very probable, that the *ſpermatick* Parts in all Ages, without Exception, are never re-united without the Intervention of a Heterogeneous Body: Tho' at the ſame time it can't be denied, but that this Body, by reaſon of the Humidity of the Parts, is not ſo conſpicuous in Infants as in adult Perſons.

A *Callus*, is call'd that *Node* which re-unites the Fracture of a Bone; which is perform'd in the following manner: The Juice that nouriſhes the Bone paſſing along through the oſſeous Fibres, and coming to that Part where theſe Fibres are broken aſunder, ſtops and gathers round the Extremities of the broken Bone, where being coagulated and dry'd, it re-unites them in ſuch a manner, that there is no other Difference to be ſeen but a ſmall Inequality or Prominency in that Part where the *Callus* is.

The *Diſſimilar Parts*, are thoſe that may be divided into various Parts, differing from one another in their own Nature and Subſtance, without any Likeneſs to one another. Thus the Hand can't be divided into other Hands, but into Bones, Nerves, Fleſh, Arteries, *&c.*

In regard of the *Functions*, the Parts of the Body may be divided into two different Sorts: (1.) Into *Organick*, and *Non-Organick* Parts. (2.) Into *Principal*, and *Non-Principal* Parts, or ſuch as are ſubſervient to others.

Theſe are call'd the *Organick* Parts, which are deſig'd for the Performance of Actions, and which, in order to anſwer this End, have receiv'd ſuch and ſuch a determinate Conformation or Figure; that is to ſay, in order to enable them to perform thoſe Functions for which they were deſign'd, 'tis requiſite there ſhould be a Continuity betwixt them: That there ſhould be a certain Proportion in Reſpect of their Situation and Number; and that there be a due Diſpoſition in their Figure and Bulk.

Theſe Parts are not altogether *Diſſimilar*, as it has been the general Opinion formerly; but they have alſo among them ſome *Similar*. Thus, for inſtance, a Nerve, notwithſtanding its being a *Similar* Part, yet as its Office is to convey and diſtribute the Animal Spirits, is nevertheleſs as much an *Organick Part*, as the Muſcles and the Hand are. The ſame Thing may be ſaid of an Artery, and a Vein.

The *Non-Organick* Parts, are thoſe that are deſign'd barely for ſome *Uſe*, without performing any Action; as the Cartilages, the Fat, the Hairs.

By the *Principal Parts*, are underſtood thoſe that are deſign'd for ſome very conſiderable and noble Action; from which depend, and by which are ſet in Motion, the Actions of divers other Parts. Of theſe, there are moſt commonly reckon'd Three, *viz.* Two relating to the *Individuum*, and One to the *Species*. The *firſt* is the *Heart*, being the head Spring of natural Heat, the *Primum Mobile* of our Body, and conſequently the Source of all Vital, *i. e.* Natural Actions. The *ſecond* is the *Brain*, which is the immediate Organ of Senſe, and of Motion, and in Mankind of Thoughts alſo. The *third*, the *Genital Parts*; becauſe from thence depends the Propagation of the *Species*.

Under the *Non-Principal*, or *Miniſterial* Parts, are comprehended all the reſt, which are ſubſervient to the *Principal Parts*; as the Stomach, the Liver, the Spleen, the Lungs, the Kidnies, the Hand.

Theſe are again ſubdivided into ſuch as are abſolutely neceſſary to the Preſervation of Life; without which, it is impoſſible for a Man to live; as the Lungs, the Stomach, the Inteſtines, the Liver, and other ſuch like: From whence it is alſo, that they have obtain'd the Title of the *Noble Parts*, and into ſuch as are not neceſſary for the Preſervation of Life, but were deſign'd only for certain *Uſes* or *Actions*, which ſerve for the Conveniencies of Life: Whence it is, that they have been call'd the *Ignoble Parts*. Of this Kind are, the Arm, the Foot, the Finger, the Hand, *&c.* which may be loſt without loſing our Life.

Laſtly, The Modern Anatomiſts divide the Humane Body into Three, *viz.* into Three Venters or Concavities, beſides the Extremities.

Theſe *Venters* are ſpacious Concavities, in which are contain'd one or more of the noble *Viſcera*, and are call'd, the *Upper*, the *Middle*, and *Inferior Venter*. The firſt, or *Superior Venter*, is the Head, containing the Brain, the Eyes, the Ears, beſides ſome other Parts. 'Twas abſolutely neceſſary, ſays *Diemerbroeck*, that the Head ſhould be plac'd in an exalted Station; partly, becauſe as here is the Reſidence of all the moſt conſiderable Faculties, it might not be too near to thoſe Places where the Concoction of the Aliments is perform'd, which elſe might diſturb the Animal Functions by their Orders or groſs Exhalations ariſing from thence; partly for the conveniency of the Senſes of Sight, Hearing and Smelling, the Objects whereof may with much more Eaſe act upon, and affect their Organs in an exalted Station, than in a lower Place, and may be better apprehended and diſtinguiſh'd by the Soul.

The *ſecond*, or the *Middle Venter*, is the *Thorax*, being the Receptacle or Reſidence of the Heart, of the Lungs, of the *Arteria Trachæa*, and of the *Oeſophagus*. The Great Author of Nature has thought fit to place it in the Middle; that, as the Royal Palaces are ſeated near the Center of the Kingdom, in the ſame manner the Heart, which is the moſt Noble among all the *Viſcera*, and the very Source of Life, ſhould keep its Reſidence in this Palace ſeated in the middle of this Kingdom of the Microcoſme, and be plac'd there as on a Throne, from whence it might with the more Conveniency ſend forth and diſperſe its Rivulets of vital Nectar and Heat, through all the ſeveral Parts of this little World.

The *third Venter*, which is commonly call'd the *Inferior*, or the *Lower Region*, is ſurrounded by the *Abdomen*; being the Seat of the Liver, of the Spleen, the Stomach, the Inteſtines, and of ſeveral other Parts deſign'd for the Coction of Aliments, and Separation and Secretion of the Excrements, and the Generation of the *Fœtus*. 'Twas abſolutely neceſſary, that theſe ſhould be placed in the lowermoſt Region; that the Inconveniencies and Impurities ariſing from the *Coction*, ſhould not prove a Nuiſance to the Noble *Viſcera*, which are ſeated in the upper Parts.

The *Extremities*, are call'd thoſe Members or Limbs which are about, and united to the *Venters*, or the three great Cavities; being diſtinguiſh'd by their Joints, and provided for the Uſe and Conveniency of humane Life.

They are of two Sorts, *viz.* the *Arms*, and *Legs*. The *Arm* is in Men divided into three Parts, *viz.* the *Humerus*, the *Cubitus*, and the *Hand*: And the *Leg* likewiſe into three, *viz.* the *Femur*, the *Tibia*, and the Foot.

Of

Of the BONES *in General.*

THE Bones are ſimilar Parts, very hard and very dry, without any Senſe, of a more cold Conſtitution than any other Parts, framed and diſpoſed for the ſtrengthning of the whole Body.

They are call'd *ſimilar Parts*, not that actually and abſolutely they are ſuch, but becauſe they appear as ſuch to our Senſes, and becauſe they cannot eaſily be divided into others. *Spigelius*, to give us a more clear Idea of it, makes a Diſtinction betwixt what is *ſimilar*, and what is like a Thing. *What is like unto a Thing*, (ſays he) is very different from what is *ſimilar*, *viz.* In the ſame Manner, as a Thing that has taken its Denomination from another, is from that, whence it has obtained its Name. Thus the Angle is different from what is angular, and the *Annulus*, or Ring, from what is annular.

The Bones, as well as all the other Parts which compoſe the Frame of our humane Bodies, are made of the Sperm; which being animated and put into Motion by the Heat only, diſentangles as it were, or unravels and ſeparates each Particle in ſuch a manner, that being thereby enabled to ſhape it ſelf into ſuch a Figure as is requiſite for, and ſuitable to the Diſpoſition of the Matter, forms a living Creature. Perhaps it will be objected, That it is very hard to conceive how ſo many different Parts ſhould be produced by one and the ſame Cauſe: It is anſwered, That the Sun, which is the Principle of Heat, produces very different Effects, according to the Difference of thoſe Matters it enlivens by its Heat; for we ſee that it melts the Wax, when at the ſame time it dries up the Earth. And as theſe different Effects owe their Origin to nothing elſe, but to the different Diſpoſition of the Matter upon which it exerts its Operations; in the ſame Manner it may eaſily be conceived, that the natural Heat, whilſt it is acting upon the Seed, extricates and ſeparates each Particle, and puts into Motion thoſe that make the Blood; whilſt at the ſame time it dries up and hardens thoſe that produce the Bones.

As to the Time of their Generation, *Aquapendens* is of Opinion, That the Bones are the firſt progenerated among all the other Parts of the humane Body. His Reaſon is, becauſe it is impoſſible to erect a Structure, without laying firſt a Foundation to ſupport it. But *Harvey* affirms with more Reaſon, founded upon a much more ſolid Experience, That the Bones are not generated before the other Parts of the Body; becauſe a great many of the Bones do not arrive to the true Nature of Bones, till the Animal comes to a certain Age; as it is obſervable in the *Bregma*, or *Os Syncipitis*, of the Infants, and in the Teeth. And it is certain, That the Subſtance of the firſt Lineaments of the Body is ſoft, mucilaginous, and viſcous, bearing no Reſemblance either to the Nature or Functions of the Bones; neither does it acquire any Solidity till by degrees, and that not till ſometime after its Formation.

The Differences to be obſerved in the Bones, are taken from Nine Things; to wit, from their Subſtance, Quantity, Figure, Poſition, Uſes, Motion, Senſe, Generation, and Cavities.

The *firſt Difference* taken from their *Subſtance* is, becauſe ſome Bones are very hard, as the *Tibia*; others are not quite ſo hard, as the *Vertebræ*; and others there are which are ſoftiſh and ſpongious, as the *Sternum*.

The *Second*, which is taken from their *Quantity*, or *Number*, is not eaſily to be determined, partly by reaſon it is ſo very great, and partly by reaſon of the great Inequality there is betwixt the Bones; ſome of them being large, as thoſe of the Arms and Legs; ſome of a middle Size, as thoſe of the Head; and ſome ſmall, as thoſe of the Fingers.

The *Third*, which is taken from their *Figure*, admits of as many Differences as there are Bones in the Body: Some are long,

as

as that of the *Femur*, or the *Tibia*; ſome ſhort, as the Bones of the *Carpus*, and the *Tarſus*; ſome round, as the *Rotula*; ſome flat, as the Bones of the *Palate*; ſome are ſquare, as the *Oſſa Parietaria*; others of a triangular Figure, as the firſt Bone of the *Sternum*.

The *Fourth* takes its Riſe from their *Poſition*; becauſe ſome Bones are placed on the Head, others in the Trunk of the Body, and others on the Extremities or Limbs. 'Tis further to be obſerved, That among the Bones belonging to the Head, ſome are plac'd deeper, as the Three ſmall Bones of Hearing; and ſome on the Superficies, as the *Cranium*.

The *Fifth* is derived from their *Uſe*; conſidering that ſome are deſigned and ſerve for the Support of the Body, as the Bones of the Thighs and Legs; others to encloſe the Parts, as the Ribs, which ſurround the Heart and the Lungs; and others to encloſe and defend, as the Bones of the *Cranium*, in reſpect of the Brain.

The *Sixth* is diſcoverable by their *Motion*; for ſome have a Motion that is apparent to the Eyes, as the great Bones in the Extremities or Limbs; others have a Motion that is not ſo manifeſt, as thoſe of the *Carpus*, or *Tarſus*; and others are quite deſtitute of Motion, as the Bones of the Head.

The *Seventh* Difference is eaſily found out, becauſe all the Bones in general are without Senſe, except the Teeth.

The *Eighth* is deduced from the different Time of their *Generation* and *Perfection*; becauſe there are ſome Bones which are come to a State of Perfection ſo ſoon as the Infant is born; as the Three ſmall Bones in the Cavity of the Ear; others there are that do not come to their Perfection till by degrees, as the Infant advances in Years, as all the other Bones of the Body; and among theſe alſo, ſome turn into Bones ſooner, as the Bones of the lower Jaw; ſome ſomewhat later, as thoſe placed at the *Fontanella*, or the great Aperture of the *Cranium*.

The *Ninth* and laſt Difference is taken from their Cavities. Some of the Bones have very large Cavities, which are full of Marrow, as thoſe of the Extremities or Limbs: Others have only certain Poroſities, which contain only a certain medullar Juice, as the *Calcaneum*: Others have alſo ſome Perforations, which afford a Paſſage to ſome Veſſels, as the Bone of the *Baſis* of the *Cranium*, and the *Vertebræ*: Others have only a ſmall *Depth* or *Inlet*, as the Bone of the *Sternum*: Others have a *Sinus*, as the *Os Frontis*, and the *Oſſa Petroſa*: Some have alſo many ſmall *Foraminæ*, or Holes, not unlike a Sive, as the *Os Ethmoides*.

There are beſides theſe, Two other Varieties to be obſerved in the Bones, *viz.* the *Convex* and the *Concave* Part. The Firſt is the *principal Part*, and the *Apophyſis* and *Epiphyſis*. The Second belongs to the Holes, the Depths or Cavities, and the *Sinus's*.

The *principal Part* is the hardeſt and moſt ſolid Part of the Bone. It is call'd the *principal Part*, becauſe it takes up almoſt the whole Bone, and therefore properly retains the Name of the *Bone*, without any other particular Name. Thus it makes the greateſt Part of the *Femur*, *viz.* all that is betwixt the Extremities, which are the *Apophyſes* and *Epiphyſes*.

The *Apophyſes* is a Prominency, or Protuberancy, ariſing upon the Surface of the Bone, with which it has but one and the ſame Continuity, as is that which is to be ſeen in the *Os Petroſum*, call'd the *Apophyſis Maſtoides*. Its Uſe is to facilitate the Articulation of the Bones, and to be ſerviceable to the Originations and Inſertions of the Muſcles and Ligaments.

The *Epiphyſis*, or *Appendage*, is a Bone join'd, and as it were added to another Bone by a bare but immediate Contiguity; ſuch is that which may be ſeen in the *Os Tarſi*. Its Uſe is to ſtrengthen the Articulations, and to be ſerviceable, as well as the *Apophyſis*, to the Inſertion of many Muſcles and Ligaments.

There are Three Sorts of *Epiphyſes*, known by the Names of the *Head*, the *Neck*, and the *Point*.

They call that the *Head*, when the Bone is raiſed to a large round Prominency, or Bunch, as that in the *Femur*. If it be ſmaller, it is called a *Condylus*, ſuch as that of the lower Jaw-bone, which enters into the Cavity of the *Os Petroſum*, and ſerves for their mutual Articulation.

The *Neck* is the ſtreighteſt or thinneſt Part of the Bone, which being very narrow in its Beginning, grows bigger by degrees. 'Tis

Tis always placed under one of the *Heads*. It differs from the Head, in that this is almost always an *Apophyſis*, and the Head an *Epiphyſis*.

The *Point* is, when the Bone makes a pointed Prominency, which is call'd the *Corone*; as is the *Styloides* of the *Os Petroſum*, and the *Caraloides* of the *Omoplata*.

The Subſtance of the *Epiphyſes* in new-born Infants, is Cartilagineous, but as they grow up it becomes harder, and turns into a Bone; but remains ſtill ſpongious, and in proceſs of Time is united to the Bone, as if it were an *Apophyſis*, and one Bone in continuity: So that it is impoſible to ſeparate it from it, unleſs it happens, that in the tender Age of Children it ſeparates it ſelf from it by ſome long Emollition. Furthermore, it is no where more ſoft, or leſs ſolid, than in that Part where it is united to the Bone; for there it is ſpongious in the Nature of a Pumice-Stone, having abundance of ſmall Holes, but no manifeſt Cavity, repleniſh'd with Marrow, within theſe Poroſities being incloſed only a certain medullary Juice which afford, it Nouriſhment. Or elſe ſometimes alſo it exceeds the Bone it ſelf in Bigneſs, in the Nature of the Baſe of a Column, by which means it ſtrengthens the Articulation.

The *Perforation*, or Hole, is a Concavity which has both an Ingreſs and Egreſs, as theſe in the Baſis of the *Cranium*; ſome of which give Entrance to the Arteries, and the others afford an Egreſs to the Nerves and Veins.

The *Foſſa* or *Depth*, is a Cavity which has an Entrance or Ingreſs, but no Egreſs; and the Edges whereof are raiſed by ſome ſmall Prominencies, not unlike unto ſmall Hillocks. It was deſign'd for to give a certain Figure to, or to contain a certain Part, as we ſee in the Cavity of the *Orbit*, which contains the Eye.

The *Sinus* is a kind of a Cavity in the Bone, the Entrance or Oriſice whereof is very ſtreight, but the Bottom large, as we ſee in thoſe in the *Baſis* of the *Os Coronale*.

Beſides theſe three Sorts of Cavities, there are alſo ſome others which are diſtinguiſh'd into *Internal* and *External*.

The *Internal* Cavities are ſubdivided into two Sorts; *viz.* into the *Larger* and *Apparent*, ſuch as are the Concavities within and along the larger Bones, which contain the Marrow; or into the leſſer and porous Cavities: Such are theſe in the *Vertebra* and *Epiphyſes*, which contain only a Medullar Juice.

The *External Cavities* are alſo ſubdivided into three Sorts; *viz.* into the great Ones, and which are ſurrounded with a thickiſh Edge, and are call'd *Cotyloides*, or *Cotylæ*, from a certain Meaſure of the Ancients: Such is that of the *Os Iſchium*, that receives the Head of the *Femur*; or in *middle ſized* and leſs deep Cavities which are call'd *Glenoides*, as is that of the *Omoplata*, which receives the Head of the *Humerus*, or into *ſmall* and *flat* Ones. Such are theſe placed at the End of the Bones of the firſt Rank of the Fingers, which receive the Heads of the Bones of the *Metacarpus*.

Theſe *Cavities* are alſo diſtinguiſh'd into *ſingle* and *double*. The firſt receive no more than one Head; ſuch as that at the Extremity of the *Radius*. But the *double* Ones receive two Heads: Such is that on the upper Part of the *Tibia*, and thoſe of the Bones of the two firſt Ranks of the Toes. They are alſo very different in their Figures; ſome are ſhaped like a Pulley, as theſe at the Extremity of the lower Part of the *Humerus*, which do receive the *Os Cubiti*: Others in the Form of a Half-Moon; as theſe on the upper Part of the *Cubitus*, &c.

All theſe *External* Cavities which ſerve for Articulations, have each on their Circumference a certain Prominency, call'd the Lip or Brow, unto which is faſten'd a circular Ligament which encloſes the Head, which they receive, and does ſerve to ſtrengthen the Articulations, and to prevent *Luxations*, which without it would happen much more frequently than they do now.

The Magnitude of the Bones, according to *Spigelius*, does not only differ in Men of a different Stature, but alſo in thoſe that are alike in Height: And it happens ſometimes, that among theſe laſt you ſhall ſee their Bones differ very much in Bigneſs; and if Beauty depends on the Slenderneſs of the Bones, ſuch as have the ſmalleſt muſt, according to this Rule, be ſuppoſed to be beſt made: Certain it is, that one of the Reaſons why Women are, generally ſpeaking, much handſomer than the Men, is, becauſe

becauſe the Bones of their Faces are ſmaller and finer made than thoſe of Men. And from hence it is alſo, that one may eaſily diſtinguiſh the Skeleton of a Woman from that of a Man. There is alſo this further Difference betwixt one and the other, That in Men the *Os Ilium* is ſmaller and ſtreighter; whereas in Women it is not ſo cloſely join'd, in order to afford the more Room for the *Fœtus*. Whence it is alſo, that the Women having their *Os Ilium* more Outward, and the *Os Sacrum* more Backwards; their Hips and Buttocks are larger than thoſe of the Men.

The Magnitude of the Bones varies alſo according to the Age of Men; for they grow from the Time of their Birth to the Age of Twenty or thereabouts, and from Twenty to Sixty they do keep the ſame Bigneſs; but after the Age of Sixty, they decreaſe continually by degrees; which happens, becauſe the oſſeous Fibres dry up and grow ſtreight, and advance cloſer to one another.

The Subſtance of the Bones is whitiſh and hard, but not altogether dry in living Bodies; but rather moiſten'd by a certain unctuous and viſcous Juice; which the more it abounds in the Bones, the more firm and ſtrong they are, and the leſs ſubject to Fractures; And, if they happen to be broken, the ſooner they will be apt to be re-united by the Intervention of the *Callus*: And conſequently, if there be but a ſmall Quantity of this Juice in the Bone, the contrary muſt be expected. Hence it is, that it is a general Opinion, that the Re-union, or Conſolidation of the Bones, is not to be effected without an intermediate *Callus*; becauſe, if the Bones be once ſeparated and taken away, they are never to be reſtor'd; but when they are broken, they can't be conſolidated again without an intervening *Callus*.

The *Colour* of the Bones, according to *Riolan* is not the ſame in all Bodies: In ſome, they are very white; in others, not quite ſo white; and in others, inclining altogether to a gray Colour. 'Tis true, beyond all diſpute, that the Variety of theſe Colours depends, in all Reſpects, from the diverſity of the Matter whereof they are form'd. For, if you take ſeveral Skeletons, and take never ſo much Pains to make them all white alike, you will find, that one or another among them will never be ſo white as the reſt, do what you can.

The *Marrow* and nervous *Juice* don't afford Nouriſhment to the Bones, as it was the Opinion of the Ancients that they did; but, acccording to the Sentiments of the more Modern Phyſicians, they are nouriſh'd by the Blood, like the other Parts of the Body. 'Tis true, the *Marrow* contributes to their Humectation, in the ſame manner as the Fat does to the ſofter Parts; but it can't be taken for their true alimentary Juice, which is no where to be met with but in the Blood; which circulating within the Subſtance of the Bones, conveys thither ſuch Particles as are adapted for their Nouriſhment, in the ſame manner as it does to all the other Parts of the Body. Hence it is alſo evident, that they are not nouriſhed, and encreaſed by way of Appoſition of one Matter upon another, like as the Stones are, but by a liquid Juice, which entring and inſinuating it ſelf into their Poroſities, and paſſing along through their Fibres, thus encreaſes their Magnitude. For, there are an infinite Number of *Tubuli* or ſmall *Ducts* in the Bodies of the Bones, (not unlike unto thoſe that are to be obſerved in the Stem or Trunk of a Tree, which carry the Juice to them) through which their true Nouriſhment is convey'd by the Arteries, and the ſuperfluous Part whereof returning through the Extremities of theſe *Ducts*, is receiv'd by the Veins, and carry'd back to the Maſs of Blood.

The *Bones*, as well of Men as of all other Animals, are never deſtitute of *Marrow*. 'Tis true, there are certain Times when they are very full, whereas at other Times they have but a ſmall Quantity of it. And it muſt be placed among the vulgar Errors to believe, that this Addition or Diminution, is to be attributed to the Moon. This Decreaſe of the Marrow, muſt be rather look'd upon as the Effect either of ſome Diſtemper, or of ſome extraordinary Fatigue, or elſe of a very bad or ſpare Diet: For, as we ſee the Fat in Humane Bodies to diminiſh after a Diſeaſe, a violent and long Exerciſe, or a continued Abſtinence, in the ſame manner the Marrow may be, and is conſumed by one or other of theſe Cauſes; conſidering eſpecially, that the Marrow is the ſame

Thing

Thing in Reſpect to the Bones, what the Fat is in Relation to the other Parts of the Body.

The *Bones* are abſolutely void of all Senſation, becauſe none of the Nerves penetrate into their Interior Part. But on the Outſide they are cover'd with a very thin Membrane, of a very acute Senſe; to wit, with the *Perioſteum*, which ſticks ſo cloſe to it, that it immediately is ſenſible of Pain, as ſoon as the Bone is affected with ſome Diſaſter. Thoſe that are ſubject to the Gout, or ſuch as have undergone an Operation on their Bones, are living and undeniable Witneſſes (to their Coſt) of this Truth; becauſe the Pains which attend theſe Operations, are moſt Exquiſite, as ſoon as they come to touch this Membrane. The Teeth are deſtitute of this Membrane call'd the *Perioſteum*, or at leaſt that Part of them that ſtands above the *Alveoli* or Sockets, as likewiſe the ſmall Bones call'd the *Seſamoidea*, the Four little Bones of the Ear, and the Extremities of the Bones that ſerve for Articulations, for fear their Motions and Colliſions ſhould cauſe exceſſive Pains in them.

There is a vaſt Number of Bones belonging to the Body, they being computed at no leſs than Two Hundred and Forty Nine in all; whereof Sixty are in the Head, Sixty Seven belonging to the Trunk of the Body, Threeſcore and Two to the Arms and Hands, and Threeſcore to the Legs and Feet. And here it is to be obſerv'd, that if the great Creator and Author of Nature had put fewer Bones into the Hand than he has done, it would not have been able to take hold of Things ſo well as it does now: That if the Spine had not been compoſed of as many *Vertebræ* as it has, it could not have bent every way as it ought to do: And Laſtly, That if the Leg and the Thigh had been made with one Bone only, we could not have walk'd with the ſame Eaſe and Conveniency we do now. Hence it is, that it was abſolutely requiſite for the Accompliſhment and Perfection of Men, and the Conveniency of his Functions, that the Number of the Bones ſhould be no leſs than it is.

Among the Threeſcore Bones belonging to the Head, Fourteen appertain to the *Cranium*, and the remaining Forty Six to the Face; comprehending nevertheleſs within their Number the *Os Hyoides*. The Fourteen Bones of the *Cranium* are, the *Os Coronale*, the *Os Occipitis*, the Two *Oſſa Parietalia*, the Two *Oſſa Temporum*, the *Os Sphenoides*, and the *Os Ethmoides*, and the Six Bones of Hearing, call'd the *Jucus Malleolus* and *Stapes*, (to be found in each Ear.) Among the Forty Six belonging to the Face, Twenty Seven appertain to the upper Mandible; to wit, the *Os Mali* or Cheek-bone, the *Os Unguis*, or the Nail-bone, the *Os Maxillæ*. The Bones of the Noſe, and of the Palate, and as many on the oppoſite Side, beſides one odd One call'd the *Vomer* or *Ploughſhare*, beſides Sixteen Teeth in the upper Jaw, and Eighteen in the lower Jaw-bone; *viz.* Two Bones and Sixteen Teeth, unto which if you add the *Os Hyoides*, it makes up the Number of Sixty Bones in the Head.

Among the Threeſcore and Seven belonging to the Trunk of the Body, Thirty Two appertain to the *Spine*, and Twenty Nine to the Breaſt. Among theſe of the *Spine*, Seven belong to the Neck, Twelve to the Back, Five to the Loins, Three to the *Coccyx*, and Five to the *Os Sacrum*. Thoſe of the Breaſt are, Twenty Four Ribs, Two *Claviculæ*, and Three in the *Sternum*. Beſides which, there are here Six *Oſſa Innominata*; *viz.* the Two *Ilia*, the Two *Iskia*, and Two of the *Pubes*, all which together make up the Number of Threeſcore and Seven in the Trunk of the Body.

The Threeſcore and Two appertaining to the ſuperior Extremities or the Arms; *viz.* Thirty One in each, are, the *Omoplata*, the *Humerus*, the *Cubitus*, the *Radius*: Eight belonging to the *Carpus* or the Wriſt, Four to the *Metacarpus*, and Fifteen to the Fingers; and reckoning as many for the oppoſite Side, the whole Number amounts to Sixty Two.

The Threſcore belonging unto the Inferior Extremities or Limbs, *viz.* Thirty on each Side, are, the *Femur*, the *Rotula*, the *Tibia*, the *Fibula*, Seven in the *Tarſus*, Five belonging to the *Metatarſus*, and Fourteen to the Toes, reckoning as many on the oppoſite Side, the whole amounts to Threeſcore.

The *Uſe* and *End* for which the Bones were deſign'd, is to ſtrengthen the Body by way of Supporters, to render the Parts ſolid and

ſteady, to impart to them their Shape or Figure, as likewiſe to comprehend and defend ſome of thoſe Parts from External Injuries: As we ſee the *Cranium* to contain and keep ſafe the *Cerebrum*, and the Ribs, the Heart and the Lungs; and laſtly, to be ſubſervient in ſome Meaſure to the Motion and Action of Walking.

There are two Sorts of Articulations of the Bones; *viz.* the *Arthron & Symphyſis*: The firſt is a natural Conjunction of the Bones, as when two Bones touch one another at the Extremities; and the ſecond is a natural Union or Coalition of the Bones; as when the Bones, tho' divided, ſeem to have but one Continuity.

The *Arthroſis* comprehends two Kinds of Articulations; one of which is call'd *Diarthroſis*, and the other *Synarthroſis*.

The *Diarthroſis*, is a kind of Articulation, in which the Motion is manifeſt; and is ſubdivided again into three Sorts; *viz.* the *Enarthroſis*, the *Arthrodia*, and the *Ginglymus*.

The *Enarthroſis*, is call'd when the large Head of a long Neck enters into a deep Cavity, as it happens in the Articulation of the *Os* of the *Femur*, with the *Iſchium*.

The *Arthrodia*, is when a flat or ſmall Head of a Bone is inſerted but ſlenderly into a ſmall and ſhallow Cavity, ſuch as you ſee in the Articulation of the *Os Humeri*, with the *Omoplata*.

Ginglymus, is when one Bone enters into the Cavity of another, either with One or Two of its Productions, and at the ſame time receives into a Cavity of its own another Bone: Such is the mutual Inſertion betwixt the *Os Cubiti* and the *Os Humeri*.

The *Ginglymus* is alſo ſubdivided into three Sorts: The firſt is, when one Bone is receiv'd by another ſingle Bone, and mutually receives the ſame; as may be obſerved in the two Bones of the Arm, and of the *Cubitus*. The Second is, when a Bone receives another Bone, and at the ſame time is receiv'd by another Bone, which it not receives as in the *Vertebræ*; becauſe the *Vertebra* being placed betwixt two others, receives that which is above it, and is received by the *Vertebra* that is below it. The Third is, when the Articulation is perform'd like an Axel-Tree in a Wheel, as the Second *Vertebra* of the Neck is receiv'd by the firſt.

The *Synarthroſis*, is a ſort of Articulation ſo firm and ſtrong, that it has either no manifeſt Motion, or at leaſt but a very ſmall and obſcure One, and that not except in caſe of Neceſſity. 'Tis alſo of Three Kinds; *viz.* the *Suture*, the *Harmonia*, and the *Gomphoſis*.

The *Suture* is an Articulation, where two Bones are conjoin'd, as if they had been ſewn together. It is ſubdivided into two Sorts; *viz.* the *True* and *Baſtard* Suture. The *True* or *Genuine Suture*, is when two Bones are conjoin'd together, like unto two Saws, the Teeth whereof enter within one another; ſuch are the *Oſſa Parietalia*, with the *Os Coronale*. The *Baſtard Suture* is, when two Bones are join'd together in form of Nails or Claws, or like Scales or Lamels placed one upon the other; ſuch are the *Oſſa Parietaria*, with the *Oſſa Petroſa*.

The *Harmonia* is a kind of Articulation, where the Margins of the Bones meet in a ſimple ſtreight Line, or in a circular One; as the Bones of the Face, the Note, and of the Palate.

The *Gomphoſis* is a compact Articulation, when one Bone is driven into another like a Nail; as the Teeth are in their *Alveoli* or *Sockets*.

Unto theſe, ſome add a third kind of Articulation, call'd the *Neutral* or *Dubious*, becauſe it is not a perfect *Diarthroſis*, for it has no manifeſt Motion, nor altogether a *Synarthroſis*, as being not depriv'd of all Motion. Such is the Articulation of the Ribs with the *Vertebræ*, and that of the Bones of the *Carpus*, and the *Tarſus*, betwixt one another; which partaking of both, is call'd *Amphiarthroſis*, and by ſome, a *Diarthroſis Synarthrodialis*.

The *Symphyſis* is a firm and natural Union of the Bones, without Motion; as when two Bones are join'd together in ſuch a manner, that they ſeem to be but one and the ſame Bone. 'Tis of two Sorts, either the *True* or the *Baſtard* One.

The true *Symphyſis* is, when two Bones are united and hardned together, without the Intervention of any manifeſt Heterogeneous *Medium*: Thus the *Mentum*, or Inferior Jaw-bone is compoſed of two Bones, without

without any manifeſt Heterogeneous *Medium.*

The baſtard *Symphyſis* is, when the Bones are join'd together by the Intervention of ſome manifeſt Heterogenous Subſtance; which is alſo of three Sorts (1.) *viz.* The *Syneuroſis*, when the Bones are united by ſome nervous Subſtance, or by a Ligament, as the Articulation of the *Rotula* with the *Tibia.* (2.) The *Syndroſis*, when the *Medium* that joins the Bones is Cartilagineous: Such is the Union of the two Bones of the *Pubes*, and of the *Os Sacrum*, with thoſe of the *Femur.* (3.) The *Syſarcoſis*, when this Union is made by the means of ſome Fleſh: As is that of the *Os Hyoides* with the *Omoplata*, and that of the Teeth with the Jaw-bones, by means of the Gums.

Of the Bones of the CRANIUM.

There are Eight Bones belonging to the *Cranium*, *viz.* the *Os Coronale*, the two *Oſſa Parietaria*, the two *Oſſa Temporum*, the *Os Occipitis*, the *Os Sphenoides*, and the *Os Ethmoides.* Three ſmall Bones belonging to the Hearing, *viz.* the *Malleolus*, the *Incus*, and the *Stapes.* Of all which, we ſhall have occaſion to treat at large in the Chapter of the *containing Parts of the Head.*

Of the Bones of the FACE.

The Face is compoſed of the two Mandibles, *viz.* the *Upper*, which comprehends all from the Eye to the Extremity of the upper Lip; and the *Lower*, which extends from the Top of the under Lip to the Point of the Chin.

In Men, the upper Jaw-bone or Mandible, is ſhort, and of a Demicircular Figure, to render the Face the more beautiful, it being longiſh in other Creatures: Beſides which, this upper Jaw is immoveable in Men, which it has common with other Creatures; except the *Parrot*, and the *Crocadiles*, which have the Moveable. According to the Opinion of ſome, this Jaw-bone was to be immoveable, becauſe if it had been knit cloſe to the *Cranium*, it would by its own Motion have forc'd the *Cranium* or Skull to move alſo at the ſame time; which muſt of Neceſſity have prov'd very incommodious to the Brains, which requires Eaſe and Quiet for the Performance of its Functions.

Its Subſtance on the Outſide is ſolid, but it is porous or *ſinuous* within, eſpecially on that Side toward the Teeth, in which Place in young Children is to be found a *Medullary* Juice for the Encreaſe of the Bone; and when in adult Perſons this Juice is conſumed, there remains a Hollowneſs in the Bone, which ſome are of Opinion adds to the Sound of the Voice.

It is furniſh'd with Blood for its Nouriſhment by the Branches of the *Arteriæ Soporales*; and it ſends back what is remaining after its Nouriſhment through very ſmall Veins to the *Exterior Jugulars.*

In conſiſts of Eleven Bones; *viz.* Five on each Side, and one in the Middle, which are divided from the *Cranium* by certain common *Sutures*, and united together by the *Harmonia*, which being a kind of *Synarthroſis*, theſe Bones are immoveable.

The firſt Bone, and which is almoſt of a Triangular Figure, is plac'd on the exterior Angle of the Eye; it is pretty large, and of a hard and ſolid Subſtance: It has an *Apophyſis*, by which it is united by an oblique Suture to the anterior Production or Proeminency of the *Os Temporum*; and this makes the *Os Jugale*, or *Zygoma*, as the *Greeks* call it, which is convex on the Outſide, but concave on the Inſide, in the Nature of an Arch. It affords a Paſſage to the Muſcle *Crotaphites*, unto which it ſerves alſo for a Defence, and gives Riſe to the Muſcle *Maſſeter*, whoſe Function, together with the *Crotaphites*, is to help the Chewing of the Aliments.

The *Second* is call'd the *Os Unguis*, or Nail-Bone, becauſe it reſembles both in Bigneſs and Shape to a Nail. It is of a thin Subſtance like a Scale, and the ſmaleſt Bone of the Upper Jaw, which makes the interior *Canthus* of the Eye. It has a Perforation and Communication with the *Noſtrils*, which is called the *Lacrymal Paſſage*, thro' which that ſerous Humour which diſtils from the Brain ſends forth the Tears into the

Eyes. But becauſe there ſhould not be a continual Running of theſe Tears, a Caruncle is placed before this Hole or Paſſage, which hinders this Seroſity, as long as it does not come in an exceſſive Quantity, beyond its ordinary Courſe, from iſſuing out too faſt, and in too great a Quantity; and at the ſame Time affords it a moderate Paſſage, ſo that it may come forth by Drops into the Eyes, and make what we call the *Tears*. Near this Bone, or about the Root of the Noſe, and the greater Angle of the Eye, ſometimes breaks out a certain Abſceſs, call'd by the *Greeks Ægilops*, which ſoon penetrating to the Bone, corrodes it if it be neglected or not well managed, and makes what we call the *Fiſtula Lacrymalis*.

The *Third* is the *Os Maxillare*, being the moſt ſpongy and the biggeſt of all the Face. 'Tis this Bone that makes Part of the Cheek, and does contribute to the forming of the *Orbit* in its inferior Part, which compoſes the greateſt Part of the Palate, and receives the upper Teeth into its ſmall *Cells*. It has a conſiderable Perforation above the *Orbit* of the Eye, where it gives Paſſage to the Third Pair of Nerves which go to the Face, as likewiſe to another Branch which goes to the hindermoſt Part of the *Dentes Inciſores*.

The *Fourth* is the Bone of the Palate. It is very hard, and ſomewhat larger than it is long, being almoſt ſquare. It is placed at the Bottom of the Palate, making the deepeſt Part of the Root of the Mouth, and is ſupported by the *Vomer*, having a *Foramen*, or Perforation, which is called *Guſtativum*.

The *Fifth*, which is hard, ſmall, and ſomewhat long, but almoſt of a ſquare Figure, makes up the riſing Part of the Noſe.

The *Eleventh*, being the odd One, as having no Fellow to match it, is call'd the *Vomer*, from its Reſemblance to a Ploughſhare. It is placed in the middle above the Palate, being hard and ſmall, and united with the *Os Sphenoides* and the *Ethmoides*, both of which have ſome ſmall Prominencies that enter into the Cavities of the Bone, and by this Means keep it ſteady in its Place. This Bone alſo divides the inner Part of the Noſtrils into Two.

The *Lower Jaw* is altogether moveable, becauſe Maſtication, which is an Action abſolutely neceſſary to the Support of Life, is performed only by it, it being ſufficient for the Comminution of the Aliments; in the ſame Manner as in a Mill, in order to grind the Corn very well, it is ſufficient for one Mill-Stone only to be moveable; with this Difference nevertheleſs, that the upper Mill-Stone, which is placed above the lowermoſt, grinds the Grain eaſily, and turns it into Meal; whereas it is quite contrary in the *Lower Jaw*, which, by the Help of divers Muſcles cloſing and preſſing hard againſt the *Upper* One, does chew and grind the Aliments.

In Children, until they come to the Age of Seven Years, this Bone conſiſts of Two, when they are joined together in the Chin by a *Synchondroſis*, and in Proceſs of Time are united in their anterior and middle Part into one, as the *Epiphyſes* do, which from Cartilages, in Time, become Bones.

Theſe Two Bones are as large as was requiſite to ſerve for a Baſis to Sixteen Teeth, that are articulated into them. Their Subſtance is very hard and ſolid, to the end that they might not want Strength to bite and to chew. Theſe together make a much handſomer Figure in Men than in any other Animal; for it is Semicircular, and not unlike an Arch. They are ſmooth and even on the Outſide, but ſomewhat rough within and on the lower Part, in order to facilitate the Originations and Inſertion of the Muſcles. That Part which is rounded before is called the *Baſis*, and the Edges are named the *Lips*, of which they have one Internal, and another External. On their upper Part they are joined to the *Os Petroſum*, being articulated with it by an *Arthrodia*, and bounded below by the Chin, which makes their inferior and anterior Part.

Two Things do fall under our Conſideration in theſe Bones, *viz.* the *ſolid* and the *hollow* Parts.

The ſolid Parts are either *ſuperior*, or elſe *inferior*. Of the *ſuperior* Ones, there are Four; to wit, Two *Apophyſes*, or Heads placed on a ſmall *Neck*, call'd *Condyloides*, which make their Articulation with the *Os Petroſum*; and Two other *Apophyſes*, or Points, nam'd *Coronoides*, which ſerve for the Inſertion of the Muſcles call'd *Crotophites*. Of the *inferior*

rior Ones, there are Three; One *anterior*, call'd the *Chin*; and Two *poſterior*, nam'd the *Angles*; one being on the Right, the other on the Left, where, on the Outſide, the Muſcle *Maſſeter* has its Inſertion; and on the Inſide, the *Pterygoides*, which do ſerve for Maſtication.

The hollow or *concave* Parts are divided into Three, *viz.* into *Perforations*, *Depths* or *Pits*, and *Sinus's*. The *Perforations* are either *Internal*, or *External*. Of the *Internal*, there are Two, placed at the Angles, which gives Entrance to a Nerve of the Fifth Pair, and to an Artery that ſpreads to all the Roots of the under Teeth. It affords alſo a Paſſage outward, to a Vein which carries back the Blood. There are alſo Two *External* Perforations, being placed toward the anterior and middle Part of the *lower Jaw*. 'Tis through theſe that a Part of the Nerve goes out, which enter'd by the internal Perforations, the Branches whereof are diſperſed into the internal Part of the Chin.

There are no leſs than Sixteen *Foſſæ*, or Cavities here, in the ſame Manner as in the *Upper Jaw*; being Cavities, or *Alveoli*, in which are fixed and faſtened the Sixteen Teeth. Some of theſe *Alveoli* have but One Cavity; others have Two, others Three, and ſome no leſs than Four, according as the Teeth have more or fewer Roots.

Of the *Sinus's* there are only Two, *viz.* One on each Side. Theſe are internal Cavities extending along the Jaw-Bone, and containing that Matter out of which the Teeth are formed.

The *lower Jaw* has various Uſes: The Firſt, which is for Ornament and Beauty's Sake, it has in common with the other Parts of the Face, becauſe they all have their Share in them: The Second is for Maſtication; and the Third for the Forming of the Voice.

Of the TEETH.

The Teeth are very hard, and very white Bones; which are diſtinguiſh'd into *Inciſores*, *Canini*, and *Molares*. Of theſe, we ſhall have Occaſion to treat in particular in the Deſcription of the Parts belonging to the Mouth.

Of the SPINA, *and the* VERTEBRÆ.

The Wiſdom of the Almighty appears with no leſs Luſtre in the admirable Structure of the *Spine*, than in the Compoſure of the *Cranium*: For as the great Creator thought fit to make this altogether of a bony Subſtance, to contain and defend the Brain; ſo he has formed the *Spine* all bony, for the better Preſervation and Defence of its Marrow (being a Continuity of the Brain) during its long Paſſage through the *Spine*. It is perforated both on the right and on the left Side like the *Cranium*, by divers Perforations, to afford a free Paſſage to the Nerves, which carry and ſpread the *Animal Juice* into all the Parts of the Body. In Effect, 'twould have been in vain for the Brain to ſeparate this *Juice*, and ſend it forth from its Source, unleſs there had been provided a certain Channel like an Aqueduct, ſuch as the *Spine* is, in order to convey it into all the Parts of the Body by Means of the Nerves.

The *Spine* is called, and conſiſts of, all thoſe Bones that are placed from the firſt *Vertebra* of the Neck unto the Extremity of the *Coccix*. It has obtained its Appellation either becauſe its hindermoſt Part is ſharp-edged or pointed, or elſe becauſe if you make an entire Separation of the *Vertebræ* from the *Trunck*, they reſemble in Shape to a Thiſtle or Thorn.

It is defined a Complex of many Bones articulated together, to ſerve for a Receptacle and Rampire to the Marrow, as the *Cranium* does to the Brain. If it had been made but of one Bone, it would have been always rigid and ſtreight like a Stake, without being able to bend; and if its Compoſition had been of Two, Three, or Four Bones only, it muſt of Neceſſity have made acute or ſharp Angles in all the Places of its Flexions or Articulations, and conſequently a Compreſſion on the Marrow, which muſt needs hinder the free Courſe of the *Animal Juice* into the Extremities of the Nerves. But now its Compoſition being of many Bones, join'd and articulated together by

by the Means of ſtrong Ligaments, it eaſily moves on all Sides, without incommoding in the leaſt the Marrow which it contains, nor the Parts of the *Thorax*, nor of the *Abdomen*, which it touches.

The Figure of the *Spine* ſeems to be ſtreight at firſt; but if you conſider it rightly, you will find that it falls inward ſometimes, and ſometimes outwards, as well for its better Support, as to remove from or approach to the Parts of the *Thorax* and the *Abdomen*.

The pointed End of the *Spine* at the Neck bends inward; which ſome pretend to be made thus for the Support of the *Aſpera Arteria* and the *Oeſophagus*: But others are of Opinion, That it was rather for the better Support of the Head, which is placed there as on a *Pivot*: For (ſay they) had the *Spine* riſen ſtreight upward, it would with its Point have touch'd the hinder Part of the Head, which thus being not rightly ſupported, would have fallen forward by its own Weight.

Thus, *add they*, the *Vertebræ* of the Back, on the contrary, do bend outwards, to augment the Concavity of the *Thorax*, becauſe the Heart and the Lungs contained therein being always in Motion, ought not to ſuffer the leaſt Compreſſion. Thus the *Vertebræ* of the Loins incline a little inward, not for the Support of the *Great Artery*, and of the *Vena Cava*, as ſome have imagined, but for the better ballancing the Weight of the Body, unto the Parts of which they ſerve inſtead of Buttereſſes for their Support: For had they bent outward, as the *Vertebræ* of the Back do, the Body, which has no other Support but them, would have been ſo far from keeping ſtreight and upright, that it muſt continually have fallen forward. The *Os Sacrum* bends outwards, in order to form the Cavity of the *Pelvis* more large, that ſo the *Inteſtinum Rectum*, the Bladder, and the other Parts that ſerve for Generation, might remain eaſie in their Poſition; but eſpecially thoſe in Women, which ſtand in need of Room during their Breeding-Time. The *Coccix* inclines inwardly, that it may not be hurt or render'd uneaſy when we ſit down, or mount on Horſeback.

Beſides this, Two Sorts of Connexions ought to be conſidered in the *Spine*, *viz.* thoſe that are *common*, and thoſe that are *proper* to it. The *common* Connexions are thoſe it has with the Parts that are join'd to it, among which, the firſt is that with the Head, unto which it is join'd by an *Arthrodia*; the *Os Occipitis* having Two Prominencies, which enter into the Cavities or *Glenoides* of the firſt *Vertebra* of the Neck. The *Second* is with the Ribs, which are articulated with the Twelve *Vertebræ* by a double *Arthrodia*, *viz.* the one in the Body of the *Vertebra*, and the other with its tranſverſe *Apophyſis*. The Third is with the *Scapula*, by a *Syſarcoſis*; there being certain Muſcles, which ariſing from the *Spinous Apophyſes* of the *Vertebræ* of the Neck, and from thoſe of the Back, have their Inſertions into the *Baſis* of the *Omoplatæ*. The *Fourth* is to the *Oſſa Innominata*, which are ſtrongly united with the *Os Sacrum*.

The proper or particular Connexions of the *Spine*, are thoſe which the *Vertebræ* do make one with another: Theſe are of Three Sorts; the *Firſt* is made by their Body's being a Kind of *Symphyſis*, call'd a *Synchondroſis*, becauſe it is made by Means of a Cartilage; the *Second* Connexion is made by their oblique *Apophyſis*, or Proceſs, being an *Arthrodia*; and the *Third* is a Kind of a *Ginglymus*, becauſe at the ſame Time that one *Vertebra* is received by the other that is below it, it receives that which is next above it.

The Ligaments which are in the Articulations of the *Vertebræ* are very ſtrong, to prevent any Luxations in thoſe violent Motions they make. They are of Two Sorts; ſome being thick and fibrous, made in the Shape of a Half-Moon or Creſcent, which tie them both above and below; and others membranous, which ſerve only to faſten them the more ſtrongly. They do ariſe from the tranſverſe and acute *Apophyſes* or Proceſſes.

As to the Uſe of the *Spine*; it has ſome that are *common*, and others that are *peculiar* to it. The *Firſt* are to ſerve for a Foundation or Prop to the Body, like all the reſt of the Bones; as likewiſe to ſerve for the Inſertions of the Muſcles. The *Second* are to ſerve for a Conveyance and Defence of the Marrow, againſt all Manner of Injuries both Internal and External, and to be a

Support

Support to the Head, the *Thorax*, the Ribs, the Legs, and the Arms; ſo that it may not improperly be compared to the Keel of a Ship, unto which the Ribs, the Stern, the Fore-Deck, and generally all the Parts of the Ship, are faſten'd.

The *Vertebræ* derive their Name from the *Latin* Word *Verto*, or *Vertere*, *i. e.* to turn, by reaſon of their continual Motion on all Sides, and in all Ways the Body is flexible in.

Five ſeveral Things are to be conſidered belonging to their Structure: The *Firſt* is, That every one of them has its Body in its Internal Part, being the largeſt Part upon which they reſt and ſupport one another. The *Second* is, That each of them has a large *Foramen*, or Hole, through which the *Spinal* Marrow paſſes. The *Third* is, That each of them has Three Sorts of *Apophyſes*, or Proceſſes, *viz.* Four *Oblique*, Two *Tranſverſe*, and One *Acute*. The *Fourth* is, That every one of them has Five *Epiphyſes*, or Appendages, *viz. Two* on the Body, *Two* at the Extremities of the tranſverſe *Apophyſes*, and *One* at the Extremity of the pointed Proceſs. The *Fifth* and laſt Thing is, That they are every one of them perforated on their Sides, to afford a Paſſage to the Nerves which ariſe thereabouts. 'Tis further to be obſerved, That theſe Perforations are not in their middle Part, which would weaken them too much; but that Two *Vertebræ* contribute toward the making up of one *Foramen* or Hole; ſo that in each of them you ſee no more than one Half of the Hole; the greateſt Part thereof being in the Cartilage, which faſtens Two *Vertebræ* together.

The whole *Spine* is computed to conſiſt of Twenty four *Vertebræ*, *viz. Seven* belonging to the *Neck*, *Twelve* to the *Back*, and *Five* to the *Loins*; underneath which is the *Os Sacrum*, with the *Os Coccygis*, which is its Appendage, and placed there to be like the *Baſis* or Foundation.

The *Vertebræ* of the Neck have Five Things common to them: The *Firſt* is, That, beſides the Seven *Apophyſes* which we told you before were to be found in every one of the *Vertebræ*, theſe of the Neck have Two more, which makes their Number amount to Nine, being placed on the ſuperior Part of their Bodies, one on the right, and the other on the left Side. They incloſe the Body of the ſuperior *Vertebra*, which is pretty ſmall, and thus prevent its ſliding or ſlipping from one Side to the other, and keep it ſteady and firm in performing the Motions of the Neck. The *Second* is, That the Body of theſe *Vertebræ* is flatter before than that of the reſt, to the end that they may not prove incommodious either to the *Arteria Trachea*, or to the *Oeſophagus*.

The *Third* is, That their tranſverſe *Apophyſes* are perforated, in order to afford a Paſſage to the *Arteriæ Cervicales*, which are conveyed through theſe Paſſages into the Brain. The *Fourth* is, That their *Apophyſes*, both *tranſverſe* and *acute*, are forked, to facilitate the Adhæſion of the Muſcles. And laſtly, the *Fifth* is, That their *acute Apophyſes* are ſomewhat couched in their lower Part, to facilitate the Motion.

The Firſt among all the *Vertebræ* is call'd *Atlas*, upon which the Head reſts, like a little World, and is moſt firmly united to it. It is leſſer, but at the ſame time much more ſolid, than all the reſt; and it has no *Spine* behind, becauſe the Motion of the Head is not made upon it, but only a Kind of Semicircular Prominency or Protuberance.

It has Two *Apophyſes* ſtretching upwards, and Two on the Sides tending a little downwards, and are perforated. On the anterior Part, it has a very hard and ſolid *Apophyſis*; on the Sides whereof are to be ſeen Four oblique Prominencies, *viz.* Two above, and Two below. On the Inſide, toward its anterior Part, it has a *Sinus*, in Form of a Demicircle, covered by a Cartilage, by which it receives the Tooth of the next following *Vertebra*.

The *Second* among the *Vertebræ* is called *Epiſtrophus*, or the *Wheeling-Vertebræ*, becauſe it is upon this that the Head and the Firſt *Vertebra* turn like upon a Pivot: And by reaſon that from the Middle of its Body there ariſes a round and hard *Apophyſis*, and ſomewhat oblong, which repreſents in ſome manner a *Tooth*, this has given the Name of *Odontoides* or Tooth-Line, alſo to this *Apophyſis*; the Surface whereof is ſomewhat unequal, to the end that the Ligament which riſes from it, and which ties it to the *Occiput*, may faſten the better to it. It is alſo ſur-

rounded

rounded by a ſolid and round Ligament, which is of a moſt artificial Texture, to prevent the Marrow of the *Spina* from being preſs'd upon by this *Apophyſis*. This *Vertebra* and the Firſt are join'd to the *Occiput*; and ſo they are join'd with one another by particular Ligaments, which tie them very ſtrongly to the Head.

The *Third* is call'd the *Axis*, or the Axel-Tree, becauſe it is this that begins to form a Body, upon which the Two preceding *Vertebræ* and the *Head* are ſupported like on an Axel-Tree. The Four following *Vertebræ* are deſtitute of any peculiar Names. 'Tis only obſervable, That the laſt among them has not its pointed *Apophyſis* forked like the others, and that it begins to approach to the ſame Shape with thoſe that belong to the Back.

The Twelve *Vertebræ* of the Back are larger than thoſe of the Neck, and ſmaller than thoſe of the Loins. Neither are they all equal, but encreaſe in Bulk and Strength, in Proportion as they deſcend lower, becauſe that which is to bear a Thing ought to have more Strength than that which is born; and beſides, being all of a Pyramidal Figure, this is an Addition to their Strength. They have their *ſpinous*, their *ſimple*, and their *acute Apophyſes*, or Proceſſes, which reſt one upon another below. Their tranſverſe *Apophyſes* are very large, for the Conveniency of the Articulation of the Ribs, which are faſten'd to them; for each *Vertebra* of the Back articulates Two Ribs, both by its Body, and by its tranſverſe Proceſſes.

The firſt of theſe *Vertebræ*, is call'd the *Eminent*; becauſe it is prominent before the reſt. The Second is call'd the *Axillary*, becauſe it is neareſt to the Armpits; the Eight next ſucceeding, are call'd the *Coſtal*, *Vertebræ* or the *Pleuritical*; becauſe they articulate thoſe Ribs which are inwardly cover'd with the *Pleura*. The Eleventh *Verteba* is call'd the *Straight*; becauſe its *ſpinous Apophyſis* does not bend downward, like thoſe of the others. The Twelfth is ſtyl'd the *Girdler*; becauſe it is placed thereabouts, where the Girdle is moſt commonly worn.

The *Loins* conſiſt of Five *Vertebræ*, which are ſtill larger and thicker than thoſe of the Back; becauſe they ſerve unto them in ſtead of a *Baſis* or Foundation. Their Articulations are not altogether ſo compact as thoſe of the *Vertebræ* of the Back, to the end that the Motions of the Loins may be the more free, and that we may bow or ſtoop with the more Eaſe. Their tranſverſe *Apophyſes* are longer and thinner than thoſe of the Back, which ſerve them in ſome meaſure inſtead of Ribs. Out of theſe nevertheleſs we muſt except the Firſt and the Fifth, which have them ſhorter; which is the Reaſon why the *Vertebræ* of the Loins never impair any Part in their Flexions and Motions which the Loins make toward the Ribs. They have Nine *Apophyſes*; for thoſe that aſcend, and do ſerve to articulate them together, are double. Laſtly, They have their *Spines* thicker and larger, which ſerve the better to faſten to them the Muſcles and Ligaments of the Back.

The Firſt of theſe *Vertebræ* is call'd the *Nephritick*, or the *Vertebra Repalis*, becauſe the Kidneys lie on the Side of it, and becauſe it is in this Place we firſt of all feel the *Nephritick* Pains. The Three next following have no peculiar Names: And the Fifth being look'd upon as the Prop and Support of the whole *Spine*, has upon that Account obtained the Name of *Aſphalites*.

The *Os Sacrum* is ſo call'd, becauſe the Ancients uſed to ſacrifice it to their Idols, or becauſe it encloſes the Privy Parts. It is very large, altogether immoveable, as alſo very thick and ſtrong, being in ſtead of a Baſis and a Pedeſtal to the Spine. It is of a Triangular Figure, hollow on the Inſide which helps to make up that Cavity, which is as the lower Part of the *Hypogaſtrium*, and commonly known by the Name of the *Pelvis*, or Baſon. On its anterior Part it is ſmooth and even, which hinders the Parts contained therein from receiving any Hurt. It is convex and unequal on its poſterior Part, which is no ſmall Conveniency for the eaſier Inſertion of the Muſcles.

This Bone has Three different Articulations: Its Firſt, which is made with the laſt *Vertebra* of the Loins, is the ſame with that of all the other *Vertebræ*: Its Second is with the *Coccyx*, which is made by a *Sychondroſis*: And the Third, which is made with the *Oſſa Innominata*, is made by Indentation. 'Tis upon this Account that we muſt take particular Notice on the upper Part of this Bone, of Two aſcending *Apophyſes*, or Proceſſes,

ceſſes, each of which has a Cavity, call'd *Glenoides*, which receives the deſcending Proceſſes of the laſt *Vertebra* of the Loins, and which produces the Firſt Articulation. On its inferior Part, Two ſmall deſcending *Apophyſes* are joined to the *Coccyx*, and theſe make the Second. And again, on its lateral Parts, divers Sinuoſities, intermix'd with Prominences, which receive, and are receiv'd again of the *Oſſa Innominata*, make up the Third Articulation.

The Parts which compoſe the *Os Sacrum* are reckon'd among the *Vertebræ*, not ſo much for their Uſe, but by reaſon of their Reſemblance to them, and becauſe they are alſo immoveable. The *Os Sacrum* is divided into Five *Vertebræ* of different Sizes, among which, the uppermoſt is the biggeſt, and they become ſmaller and ſmaller gradually, in Proportion as they deſcend, the laſt being the leaſt of all the reſt. Theſe *Vertebræ* are eaſily ſeparated from one another in young Children, becauſe thoſe Cartilages by which they are join'd together being not as yet turned into Bones, do eaſily come off if they are boiled; but in adult Perſons they are ſo ſtrongly united together, that they make up no more than one ſingle Bone, which of Neceſſity was to be very ſtrong, in order to be able to ſupport the whole *Spine*, and to articulate the Hip-Bones ſo ſtrongly as it does.

'Tis at the *Os Sacrum* that the Cavity ends, which contains the *Spinal* Marrow. 'Tis further to be obſerved, That the *Foramina*, or Holes, which are in it for the Tranſmiſſion of the Nerves, are not ſituated laterally, as they are in the other *Vertebræ*, but before and behind; becauſe having its Articulations on the Sides with the Hip-Bones, they could not ſuffer any Perforations there. The *Foramina*, or Holes before, are larger than thoſe behind, becauſe the Nerves that paſs through the anterior Holes and which diſperſe themſelves through the anterior Parts of the Thighs and Legs, are larger than the others. Its tranſverſe *Apophyſes* are very ſmall: And 'tis upon this Account that they do not give the leaſt Inconveniency to its Articulation with the Bones of the Haunches.

The *Os Sacrum* has Five ſeveral Uſes: The Firſt is to ſerve for a Prop and Support to the *Spine*: The Second is to contain the Parts of the *Hypogaſtrium*, by forming a Cavity ſufficient and proportionable to their Magnitude: The Third Uſe is to defend them: The Fourth to articulate the Hip-Bones: And laſtly, the Fifth to give Originations and Inſertions to many Muſcles.

The *Coccyx*, or Rump-Bone, is the lowermoſt Part or Extremity of the *Spine*. It has its Denomination from its Reſemblance to the Beak of a *Cuckow*. Its Situation is at the very lowermoſt End of the *Os Sacrum*, being compoſed of Three Bones; the largeſt of which does touch the *Os Sacrum*: The Second is ſomewhat ſmaller: And the Third, which is very ſmall, is that to the End of which is faſten'd a Cartilage. They are all Three join'd together by a very looſe Connexion, which is the Reaſon why they are ſo very pliant, and to give way or draw back behind with ſo much Eaſe. In Women theſe Bones do jet more outwards than they do in Men, becauſe they ſtand in need of a larger Cavity to encloſe the Womb, and to contain the *Fœtus* during the Time of their being with Child. The Extremity of theſe Bones does always bend inwards, to the end that it might not prove incommodious to us when we are ſitting down. Nevertheleſs they draw backwards a little, to facilitate the Expulſion of the groſs Excrements; and in Women, to afford the larger Paſſage to the Infant at the Time of their Delivery.

Its Uſe is to ſupport the *Inteſtinum Rectum*, and in Women alſo the *Vagina* of the *Matrix*, which is faſten'd to and ſupported by this Inteſtine.

Of the STERNUM.

The *Sternum* is all that *anterior* Part of the *Thorax* which above touches the *Claviculæ*, and ends on its lower Part at the Cartilage *Xiphoides*; and on the Sides, as well on the Right as on the Left, at the anterior Extremities of the Ribs. It riſes forward, but turns off towards the Ribs, to form that round and oval Figure of the Breaſt, on which it is, as it were couched; whence it is called the *Sternum*.

This Bone is of a Fungous Subſtance, and not ſo white as the other Bones are. In Infants, it is altogether Cartilaginous, unleſs it be the firſt Bone, unto which the *Claviculæ* are annexed.

In Perſons of an advanced Age, it is wholly *Oſſeous*: And 'tis not without much Difficulty, that even the Cartilages, by Means of which it is joined to the Ribs, can be ſeparated from it with the Diſſecting-Knife: But in thoſe of a middle Age, its Subſtance is partly Oſſeous, partly Cartilaginous.

It is generally ſuppoſed to conſiſt of Three Bones, join'd together by thoſe *Cartilages* that are placed betwixt their Interſtices, which ſerve here inſtead of Ligaments.

The Firſt, or the uppermoſt of theſe Three is much larger and thicker than the others, its upper Part being like a Creſcent: And 'tis upon this Account (as I ſuppoſe) that ſome have given it the Name of the *Upper Fork*. On either Side of its ſuperior Part is to be ſeen a *Sinus*, which receives the Head of the *Clavicula*, wherewith it is united by the Means of a Cartilage. It has beſides this, another Sinuoſity in the middle of its internal and ſuperior Part, which makes Room for the *Arteria Trachæa*.

The Second, or the middle Bone, is faſten'd to the Firſt by Means of a Cartilage plac'd betwixt both, and is much narrower and thinner, but alſo much longer. It has on each Side Five or Six Sinuoſities, diſtant from one another at unequal Intervals, which receive the Cartilages of the Ribs.

The Third is ſtill ſmaller than the Second, but much thicker, being placed underneath the Two former, and having at its Extremity a Cartilage, which by reaſon of its Reſemblance to the Point of a Sword, is called *Xiphoides*, *Enſiformis*, *Scutiformis*.

This Cartilage is of a Triangular Figure, and of the Length of a Finger's Breadth. 'Tis rarely found to be double, there being ſeldom more than a ſingle One. Nevertheleſs it is ſometimes forked, for the Conveniency of the Paſſage of the Veſſels; whence it is called the *Fork*. Sometimes it is round and perforated, and affords a Paſſage to the Mammillary Artery and Vein. If ſo it happens, that it is not forked nor perforated, there is a Perforation in the Middle of the *Sternum*, eſpecially in Women, as *Ridlan* has very well obſerved.

This Cartilage ſometimes bends outward, and ſometimes ſinks inwards by ſome Stroak or Fall, not without great Danger to the Stomach, and its adjacent Parts; being commonly followed by Vomitings an Atrophie, and other dangerous Diſeaſes, which do not ceaſe till it be reduced to its natural Poſition. It happens alſo ſometimes in aged Perſons, that it turns into Bone: An Inſtance of which *Pavius* did obſerve in a certain Perſon, that had been aſthmatick for a long Time. And *Veſling* gives us an Account of another, in whom this Cartilage being extended to a Finger's Length down to the Navel, was grown very hard and ſtiff to ſuch a Degree, that it not only proved very incommodious to the affected Party when he was to bow or ſtoop, but alſo much diſturbed the Concoction of the Stomach, and the Diſtribution of the Chyle. About that Part where this Cartilage is placed, on the Outſide, there appears a certain Cavity, call'd by the *Latine*, *Scrobiculus*, and commonly the Pit of the Heart, becauſe the Heart, which is encloſed in the *Pericardium*, and join'd to the nervous Center of the Diaphragm, touches it here. *Riolan* has obſerved, That in Women with Child, and ſuch as have very large Breaſts, the very Weight of their Breaſts has ſtreighten'd the *Sternum*, and conſequently the Breaſt, which has occaſion'd in them a continual Difficulty of Reſpiration.

This Cartilage ſerves to defend the Stomach, to faſten the Diaphragma, and to ſupport the Liver before by Means of a large Ligament, by which it is faſten'd unto it.

The Uſes of the *Sternum* are, to form the anterior and middle Part of the Breaſt; to join and articulate the Ribs, and the *Claviculæ*; to contain and defend the Heart, and the Parts deſign'd for Reſpiration; and laſtly to faſten all along its middle and interior Part, the *Mediaſtinum*, which is a Membrane that divides the Breaſt into Two Parts.

Of the RIBS.

The *Coſtæ* or Ribs, are ſo call'd, becauſe they are plac'd on the Sides of the Breaſt, whoſe lateral Parts they form, as well on the Right as on the Left.

The Ribs are of a boney Subſtance, in order to render them the more ſolid and firm; or at leaſt they are ſuch in the greateſt and moſt principal Part of their Extent; *viz.* in that Part where they approach to, and are articulated with the *Vertebræ*; as alſo in the Sides: But their Anterior Part is of a ſpongy Subſtance. Whence it is, that if a Rib happens to be fractured, there ſoon grows a *Callus*, and conſequently the Fracture is ſooner conſolidated than in any other Bone. As to what relates to their Anterior Part, which is the ſmalleſt, being the ſame by which they approach to the *Sternum*, it is altogether Cartilaginous, to facilitate the Motion of the Breaſt. In Women nevertheleſs theſe Anterior *Cartilaginous* Productions ſometimes become very hard, approaching to the Nature of Bones; perhaps to the end that they might with the more eaſe ſupport the Weight of the Breaſts, which are plac'd and reſt upon them; becauſe it never happens thus in Men. In new-born Children, their Extremities or ſmall Heads, by means whereof they are articulated with the *Vertebræ*, are Cartilaginous, but in a little time after they acquire the ſolidity and firmneſs of Bones.

Their Figure is a Semicircle or Creſcent, if you examine but one ſingle Rib at a time; but if you take two together in the ſame Poſition, as you ſee them in a Skeleton, they do make a compleat Circle. They are of a Concave Figure within, the better to form the Cavity of the *Thorax*; but Convex on the Outſide, the better to reſiſt any External Accident or Force. That Part of the Rib that is fartheſt diſtant from the *Sternum*, is the narroweſt and roundeſt, but as they approach nearer and nearer toward the *Sternum*, they become broader and flatter. Nevertheleſs they differ in their Bigneſs alſo betwixt one another, the ſuperior being ſhort, the middle Ribs the biggeſt of all, and the lowermoſt very ſmall. This Difference in their Magnitude was neceſſary to form the Arch of the Breaſt, and tho' both the Superior and Inferior Ribs are the ſmalleſt, they nevertheleſs differ from one another, in that the Superior are larger than the Inferior Ribs.

The Ribs are articulated at their Extremities with other Bones; at their Anterior Extremities with the *Sternum* by a *Synchondroſis*, and at their Poſterior Extremities with the *Vertebræ* by an *Arthrodia*. This laſt Articulation is double in the Seven firſt Ribs, one of them being made with the Body of the *Vertebra*, and the other with the tranſverſe *Apophyſis* or Proceſs; whereas the Five lower Ribs are only join'd by a ſimple Protuberancy or Prominency.

The Ribs are Twelve in Number on each Side, it being a very extraordinary Thing to meet either with Eleven or Thirteen on a Side in any humane Body. It would make a Man laugh heartily, to hear how Solicitous ſome over-curious People are in making an Enquiry into the true Number of the Ribs of *Adam*, the Father of Mankind, and how many he had as well before as after the Formation of *Eve*, which was framed out of one of his Ribs: They enlarge upon this Head with as much Concern and Eagerneſs, as if it were one of the main Points belonging to *Anatomy*; and which conſequently ought of neceſſity not to be paſſed by in Silence. *Plempius* however has thought fit to oblige theſe curious Naturaliſts with an Anſwer; *viz.* That the Woman was not ſhap'd or form'd only out of the bare Rib of *Adam*, but out of his Rib as it was cover'd and ſurrounded with Fleſh; becauſe in *Geneſis* it is ſaid, That *Adam* ſeeing *Eve*, ſaid, *See here is now Bone of my Bones, and Fleſh of my Fleſh.* He would not have added theſe laſt Words, had ſhe been made only of his bare Rib without any Fleſh upon it. And in the ſame Place the holy Text ſays, That God *cloſed up the Place*, from whence he had taken this Rib, *with Fleſh, i. e.* Fleſh and Bone together. They are alſo divided into *true* and *ſpurious* Ribs. The *true Ribs*, are the Seven uppermoſt; being ſo call'd, becauſe they make a more compleat Circle than the others, for they reach to the very *Sternum*, wherewith they are join'd by a firm Articulation. The Two firſt on each Side, reckoning from above, are call'd the *crooked*; the

two next following, the *ſolid*, and the Three others the *pectoral* Ribs. The Five lowermoſt are call'd *ſpurious* Ribs, becauſe they are ſmaller, ſofter and ſhorter than the others, and don't reach to the *Sternum*, which is the Reaſon why they have but a very ſlack Articulation. Behind, they are faſtened to the *Vertebræ*, and on the Anterior Part they terminate in long and ſoft Cartilages, which turn upward, and are united ſo cloſely to the upper Ribs, as if they were glewed to them, unleſs it be the laſt Rib of all, which being the ſmalleſt of all the reſt, does not adhere to any other on its fore Part.

Two Sorts of Parts do fall under our Conſideration in the Ribs; to wit, their *Bodies*, and their *Extremities*. We call that the Body, which makes the middle and principal Part of them. The ſuperior Part is alſo remarkable for its Two *Lips*; one whereof is *Internal*, the other *External*, unto which the *Intercoſtal* Muſcles are faſtened: And ſo is their *Inferior* Part, which has alſo Two *Lips* ſeparated from one another by a Sinuoſity ſtretching along the Rib, and which diſappears by little and little, in proportion as it is more diſtant from the *Vertebra*. This *Sinus* ſerves for a Receptacle to a Nerve, an Artery, and an *Intercoſtal Vein*.

A ſingular Care ought to be taken of this *Sinuoſity* in the Operation of the *Empyeuma*; and above all Things of theſe Intercoſtal Veſſels ſeated here, for fear of hurting them. *Bartholin* and *Hournius* are of Opinion, that they may be avoided by making the Inciſion from above downwards. Their *Extremities* are double; one of them being join'd to the *Sternum*, and the other to the *Vertebræ*, as has been ſhewn before. At the Anterior Extremity there is a ſmall Cavity in the End of the Rib, which ſerves to receive the Point of the Cartilage, which by this means is more ſtrongly united there, than if it were only laid upon it: And at the other Extremity there is (beſides its double Articulation by *Arthrodiâ*) a Ligament alſo, which faſtens and ties it to the *Vertebra*. The Uſe of the Ribs is, (1.) To keep the *Thorax*, and the upper Part of the *lower Venter* diſtended; to the end, that in the firſt, the Heart and Lungs, and in the laſt, the Liver, Spleen and Stomach, might not be oppreſs'd by the Weight of the circumjacent Parts. (2.) To defend theſe, and all the other Parts contained in either of them from External Injuries. (3.) To ſupport the Muſcles deſign'd for Reſpiration, and to be ſubſervient to their Motions; and for this Reaſon it was, that the *Thorax* could not be compoſed of one ſingle continued Bone, which muſt have been immoveable, and conſequently would have prov'd an Obſtacle to Reſpiration; ſo that it could not have been perform'd with the ſame Eaſe as now it is.

Of the CLAVICULÆ.

The *Claviculæ* or Clavicles, are ſo call'd, either becauſe they are in the Nature of Keys which lock up the *Thorax* on its ſuperior Part, or elſe becauſe they lock together the Shoulder with the *Sternum*: Beſides, the Arms have no other Bones than theſe, by which they are faſten'd to the Breaſt.

They are Two ſmall Bones, having a tranſverſe Situation, one on each Side above the Breaſt, betwixt the Joint of the Bone of the Arm, and the ſuperior Extremity of the Bone of the *Sternum*.

Their Subſtance is thick, but porous and ſpongious, which is the Reaſon that they are eaſily fractur'd by any External Violence, Fall or Blow; but when ever any ſuch Fracture happens, for the ſame Reaſon their Re-union is ſooner made by a *Callus*, than in any of the other Bones.

Their Figure is like unto that of an S, made of Two Demicircles, conjoin'd and oppoſite one to the other: It is Convex on the outſide towards the Neck, but a little hollow within, to prevent any Compreſſion of the Veſſels that are placed underneath it. It has been obſerv'd, that in Men they are ſomewhat more bent; which is the Reaſon that the Motions of their Arms are much more free: Whereas they being ſomewhat ſtraighter in Women, they can't uſe their Arms with the ſame Agility, nor throw a Stone with the ſame Force as Men do. But this ſmall Defect is abundantly made good to them by the Beauty of their Neck, which is much more riſing, longer, ſmoother, and leſs ſubject to Wrinkles and Cavities, than thoſe of Men.

By one of their Extremities, which is round, they are faſten'd to the upper End of the Bone of the *Sternum*; and by the other, which is flatter to the *Omoplata*, whereabouts they form the *Acronium*, *i. e.* the ſuperior Part of the *Humerus*.

Each *Clavicle* has alſo a Protuberancy, and Two ſuperficial *Sinus's*, which give Riſe to the *Muſculus Subclavius*, and to part of the *Pectoralis*. 'Tis upon this Account, that on each Side towards their Extremities they are unequal, to the end that the Ligaments which ariſe thence may adhere the cloſer to them. That moveable *Cartilage*, call'd by ſome the *Cloture*, (or Encloſure) which is to be ſeen in this Place, is not united with them, but is retain'd by thoſe Ligaments that incloſe the Joynt, to the end it may the better give way to the *Omoplata*, and to the Motions of the Arm.

The Uſe of the *Clavicles*, is, (1.) To be Aſſiſtant to the various Motions of the Arms, which thereby move more commodiouſly both forwards and backwards, by reaſon they reſt upon thoſe Bones, like upon a Baſis. (2.) To prevent the Arms from extending or moving too much forward. Whence it is, that thoſe Animals which ſtand moſt in need of their ſuperior Extremities, to aſſiſt them in that Motion which carries them forward, are deſtitute of the *Clavicles*, which makes them move on with the more Eaſe.

Of the OMOPLATA.

The *Omoplata* or *Scapula*, or the Shoulder-Blade, is a broad and ſlender Bone, eſpecially in the middle, and thick in the *Apophyſes* or Proceſſes, being plac'd at the back Part of the ſuperior Ribs, unto which it ſerves inſtead of a Buckler.

Its Figure is Triangular, Two Angles whereof are Poſterior, and the third Anterior. On the Inſide, it is ſomewhat Concave, and Convex on the Outſide: Not only for the better Support and Defence of the Poſterior Part of the *Thorax*, but alſo for the ſtrengthening of the Articulation of the Bone of the Arm with the *Clavicles*; as alſo to faſten the Muſcles. It has Three different kinds of Connexions, one whereof is made by *Arthrodia* with the *Humerus*, having at its anterior Angle a Cavity, call'd the *Glenoides*, which receives the Head of the *Humerus*. This Cavity is cover'd over with a Cartilage, that facilitates the Motion, and it has a ligamentous Edge or Brim, which rendering the Cavity deeper, and embracing the Head of the *Humerus*, ſerves to ſtrengthen its Articulation. The *Second* is made by a *Synchondroſis* with the *Clavicula*, by the means of a Ligament, which joins this Bone to the *Clavicula*. The *Third* is made by a *Syſarcoſis*, with the *Vertebræ* and the Ribs; there being on the backſide nothing but Muſcles, which join it to the adjacent Bones.

Three Things ought to be conſider'd in the *Omoplata* or Shoulder-blade; *viz.* its *Baſis*, and its Two *Surfaces*.

The *Baſis* being its poſterior Part, and which is the next to the *Vertebræ* of the Back, terminates with Two Angles; one whereof is call'd the *Superior*, and the other the *Inferior* Angle. The Parts which extend from thoſe Angles towards its Neck, are call'd the *Coſtæor* Ribs of the *Omoplata*; of which there are alſo Two, one which is the ſlendereſt and ſhorteſt, being call'd the *upper Coſta*; and the other, which is the longeſt and thickeſt, the *lower Coſta*.

The Two Surfaces of this Bone are alſo different from one another; the *interior* Part being Concave, and ſerving for a Receptacle to the *Muſculi Scapulares*; but the *External* is elevated or riſing to form an Eminency, which from the bottom of the *Baſis* does riſe ſtraight upwards, and is call'd the *Spina* of the *Omoplata*, and the Extremity thereof, the *Acrominum*, becauſe it bears a Reſemblance to an Anchor. Some have made this a peculiar Bone different from the others; becauſe during the Infancy of Men, it is no more than a Cartilage, which, after the Age of Twenty, becomes ſo hard, and is ſo firmly united to the reſt of this *Spina*, that it appears to be one and the ſame Bone.

On each Side of this ſame *Spina* there are two Hollowneſſes; one above, and therefore call'd the *Foſſa Supra Spinata*, which contains the *Muſculus Supra Spinatus*; and the other underneath, call'd the *Foſſa Infra Spinata*, being larger than the former.

Beſides the *Muſculus Infra Spinatus*, it contains alſo divers other Muſcles, which do

ſerve

ſerve for the Motion of the Arm; and in the middle of this *Spina* is a crooked Eminency, call'd the *Creſt*, or the *Wing* of a *Bat*, by reaſon of its Reſemblance.

The *Apophyſis*, which is plac'd on the ſuperior Part of its Neck, and which reaches above the Head of the Bone of the *Arm*, is call'd the *Coracoides*, from its Reſemblance to the Bill of a Raven. It ſtrengthens the Articulation of the Shoulder, and gives an Origination to one of the Muſcles of the Arms, which upon that Account is call'd the *Coracoides*.

Beſides which, two other Cavities are to be obſerv'd, one whereof is betwixt the Neck and the *Acromium*, and the other between the ſuperior *Coſta* and the *Apophyſis Coracoides*: Both theſe afford a Paſſage to the Veſſels. And laſtly, that Cavity which is at the Extremity of the exterior Angle, is called the *Glenoid Cavity* of the *Omoplata*.

'Tis further worth our taking Notice of, that the Shoulders are, generally ſpeaking, either narrower or broader, according as the *Omoplatæ* are either bigger or ſmaller. 'Tis alſo a common Opinion, That ſuch Men as are broad Shoulder'd, procreate large Children; as thoſe that have ſmall Shoulders procreate little ones: And notwithſtanding we are by daily Experience convinced of the uncertainty of this Opinion, yet *Foreſtus* has thought fit to ſay ſomething upon this Subject. 'Tis very well worth our Obſervation, *ſays he*, and the Women have taken it as a common Opinion founded upon long Experience, That thoſe Men that have broad Shoulders, procreate moſt frequently large Children. Thus, adds he, *Jodoca, my Mother-in-Law, who had had no leſs than Twenty Children by her Husband, would not marry any of her Daughters to Men that had broad Shoulders.*

Riolan tells us, That the Maidens in *France* have frequently the Right Shoulder-blade placed higher than the Left; concerning which, ſays he, it is very difficult to give a ſufficient Reaſon. *Diemerbroeck* has alſo made another Obſervation concerning the Shoulder-blades among the *Hollanders*, viz. That ſuch among them as in their Childhood or Adoleſcency have uſed the Right Arm to frequent and violent Exerciſes, have the Right *Omoplata* at a greater diſtance from the Ribs than the Left.

The Uſe of the *Omoplata* or Shoulder-blade, is to give to the Muſcles their Originations and Inſertions, as all other Bones do, to faſten the Arm to the Body, and to ſerve to it for a Support, to the end it may perform its Motions with more conveniency to form the Shoulder, and to defend by its broadeſt Part, which is plac'd over the Ribs, the internal adjacent Parts.

Of the OSSA INNOMINATA, *or* HIP-BONES.

The *Oſſa Innominata*, or the Hip-bones, which make up the poſterior Part of the Trunk of our Body; are ſo call'd, becauſe no general Name which comprehends them, all has been given to them, tho' each of them has its peculiar Name.

There are Two of them, *viz.* One on each Side placed in the inferior Part of the Trunk, and articulated on their poſterior Part with the *Os Sacrum*, and on their lateral Parts with the *Femur*.

The *Firſt* Articulation is made by a *Ginglymus*, for divers ſmall Prominencies on either Side of theſe Bones enter into the Cavities, which are proportion'd to their Bulk; ſo that theſe Bones receive, and are mutually receiv'd. The *Second* is made by an *Enarthroſis*: For the *Head* of the *Femur*, which is very large, is receiv'd by a great Cavity, which is on the lateral and exterior Part of this Bone. At the very Bottom of this Cavity is to be ſeen a ſmall Inequality, which is the Place unto which that *Ligament* is faſten'd, that keeps the Head of the *Femur* ſtedfaſt in its Place, and prevents its being diſlocated, unleſs it be by ſome violent Force, as it happens in the Luxations of theſe Parts.

Theſe Bones are ſtronger, but ſmaller in Men; and larger and ſlenderer in Women. Whence it is, that That Cavity which is call'd the *Pelvis*, or the Baſon, which is form'd by theſe Bones in conjunction with the *Os Sacrum*, is much more capacious in Women: Becauſe it contains not only the *Inteſtinum Rectum* and Bladder, as it does in Men; but beſides this alſo, the *Matrix*, which

which requires a great deal of Room, eſpecially during the Time of Child-bearing. And hence it is alſo, that Child-bearing Women are often afflicted with Pains in that Part, which is occaſion'd by the Weight of the *Fœtus*.

The Uſes of theſe Bones are to ſerve for the Faſtening of the Muſcles, and for a Baſis to the whole Body, as all the other Bones do; to tie together the inferior Extremities with the Trunk; and to uphold and ſupport the *Spine*; to be Aſſiſtant in forming the Concavity of the *Lower Venter*; and to be inſtead of a Baſe and Couch to the Parts contained in the *Hypogaſtrium*.

The Hip-Bones are compoſed of Three different Bones, join'd together by the Means of *Cartilages*, which in Proceſs of Time become dry; nay, even turn into Bones, in ſuch a Manner, that in adult Perſons they ſeem to make but one Bone.

Theſe Cartilages do not alter their Nature, but remain ſuch till the Tenth or Twelfth Year of Age; and after that, they do not ſo far degenerate from their own Nature, but that they leave behind them certain Marks or Streaks, by the Means of which the Hip-Bones may be ſeparated, and divided into Three Bones, *viz.* the *Os Ilium*, the *Os Iſchium*, and the *Os Pubis*. The *Os Ilium* is ſo call'd, becauſe it contains the Gut *Ilium*: 'Tis this that offers it ſelf firſt to your Sight, being not only the biggeſt, but alſo placed above the others. Its Articulation with the *Os Sacrum* is made by a *Ginglymus*, being fortified by a Cartilage, and a very ſtrong membranous Ligament.

The Figure of this Bone is *Semicircular*; where you muſt take Notice of its Two Surfaces, *viz.* One Internal, which is fill'd up with One of the *Muſculi Flexores Femoris*, call'd the *Flexor Iliacus*, from the Place where it is ſituated; and the other External, where the *Muſculi Extenſores Femoris* have their Inſertions, call'd otherwiſe the *Glutei*. What is contained betwixt theſe Surfaces is the *Coſta*, which is bordered with Two Lips, One of which is likewiſe Internal, and the other External.

The Two Extremities of this *Coſta*, or Rib, do terminate in Two Prominencies call'd *Spines*, of which, the *Superior* is much bigger than the *Inferior*. Near unto this laſt, which is placed before, is ſeen a Kind of Indenting, that facilitates the Paſſage of the Tendons of the *Muſculi Iliaci*, and of the *Pſoas*, to the crural Arteries and Veins, as alſo to the Spermatick Veſſels.

Laſtly, this Bone alſo, with its Inferior Part, makes up a Part of that Cavity which receives the Head of the *Os Femoris*.

The *Os Iſchium*, being the Inferior Part of the Anonimous or the Hip-Bone, is thick and ſtrong. Three Parts belonging to it fall under our Conſideration: The Superior Part, which makes the greateſt Part of the *Acetabulum*, or the *Cotyla*; the Anterior Part makes a Part of the *Foramen Ovale*; and the Inferior, is that on which you may obſerve Two *Apophyſes*, the One, which is the Poſterior, being call'd the *Spine*, and the other, which is the Exterior and Inferior. There is alſo to be obſerved a *Sinus*, or Cleft, which affords a Paſſage to the Tendon of the *Obturator Internus*.

This Bone is annexed to the *Os Sacrum* by a double Ligament that riſes from it; One is inſerted into the acute *Apophyſis* or Proceſs of the Hip-Bone, and the other behind at its *Epiphyſis* or *Appendage*, which ſerves for a Support to the *Inteſtinum Rectum*. Its Extremity is call'd the *Protuberancy of the Iſchium*, which gives Originations to the Muſcles of the *Penis*, to the *Levatores Ani*, and many of the *Flexores Femoris*.

The *Os Pubis*, which is alſo call'd the *Os Pectinis*, is a ſlender Bone placed at the Middle and Anterior Part of the Trunk. It has Four different Parts worth our Obſervation. The *Anterior* Part, which is join'd with its Fellow by a *Synchondroſis*, by the Means of a Cartilage. The *Poſterior*, which being the Extremity behind the *Spine*, does make up one Part of the *Cotyla*. 'Tis betwixt this Part and the Extremity of the *Os Ilium* that the *Sinus* is placed, through which the Tendons of the *Muſculi, Lumbares*, and *Iliaci* do paſs. The ſuperior Part, otherwiſe call'd the *Spine*, is that where the Muſcles of the *Abdomen* are inſerted. And laſtly, the inferior Part is that which is join'd to a Prominency made by the tuberous Part of the *Iſchium*, which Two Prominencies make the *Foramen Ovale*, called alſo *Tyroides*, which forms a Prominen-

cy

cy that ſerves for an Inſertion to many Muſcles.

The *Oſſa Pubis* are ſlenderer and broader in Women than they are in Men: And thoſe whoſe Bones of the *Pubes* ſtand out moſt forwards, have the eaſieſt Labour.

'Tis a Queſtion, Whether the *Oſſa Pubis* do move or not? *Diemerbroeck* anſwers, That theſe Bones never move of themſelves, by Reaſon or by Means of thoſe Muſcles which have their Inſertions into them, but only by Accident, *viz.* as far as they follow in ſome meaſure the Motion of the adjacent Parts. For 'tis certain, that when the Legs, the Back, or the Loins move, they move, though never ſo little, together with the whole Hip-Bone; but not any one of them in particular.

'Tis another Queſtion, *viz.* How it is poſſible that the *Fœtus*, being come to its Maturity, and natural Bulk, does paſs at the Time of Parturition through the ſtreight Paſſage of the *Pelvis*, which on all Sides is covered and fill'd up with Muſcles, and ſome other Parts? The ſame *Diemerbroeck* gives us this following Anſwer, That if the *Fœtus* is but ſmall, it may paſs through this ſtreight Place without much Difficulty, as is ſeen by daily Experience; becauſe during the Time of Parturition, the Genital Parts become ſo ſlippery, ſo much ſoften'd and relaxed by the Afflux of the Humours, that the Midwife or Chirurgeon may without much Difficulty put a whole Hand within it, if Neceſſity requires. But if the *Fœtus* happens to be large, and that the Parts are very ſtreight, then the Parturition proves very difficult and laborious; and then it is that the *Oſſa Pubis*, by the Relaxation of the Ligaments and their Cartilages, open themſelves in the Middle, though never ſo little; and even the Cartilaginous Connexion of the *Os Sacrum* with this Bone, is relaxed to ſuch a Degree, that they viſibly open, and are divided from one another; in the ſame Manner as the Vegetables, when come to their Maturity, open themſelves to force out the Seed contained within them.

'Tis owing to this Diviſion or Separation, that ſuch Women as have a very hard Labour, or whoſe *Fœtus* is very big, complain frequently of exceſſive Pains about the *Os Sacrum*, and thoſe of the *Pubes*; as likewiſe that thoſe that have born a good Number of Children, have very thick Cartilages. 'Tis alſo owing to this Cauſe, that Maidens who do not marry till they are pretty well in Years, have commonly much harder Labours than thoſe that are married young, theſe Cartilages being become dry in them. And though the other Cartilages of the humane Body grow dry in Proportion as the Perſon advances in Age, and at laſt become oſſeous, nevertheleſs theſe Cartilages never are quite exſiccated in Women, nor ever turn into Bones.

Of the Bones of the HAND.

The Hand is divided into Three Parts; to wit, the *Arm*, the *Cubit*, and the *Hand*, properly ſo called. The *Arm* conſiſts only of one ſingle Bone, call'd the *Humerus*; the *Cubit* of Two, call'd the *Cubit*, or *Ulna*, and the *Radius*; and the *Hand*, properly ſo called, is compoſed of Twenty ſeven, *viz.* Eight in the *Carpus*, Four in the *Metacarpus*, and Fifteen belong to the *Fingers*: Of all which, we ſhall have Occaſion to treat more in particular in the Fourth Book.

Of the Bones of the FOOT.

The Foot likewiſe conſiſts of Three Parts; to wit, the *Thigh*, the *Leg*, and the *Foot*, properly ſo called. The *Thigh* has but one ſingle Bone, call'd the *Femur*; the *Leg* is compoſed of Two, *viz.* the *Tibiæ* and the *Perone*; and the *Foot*, properly ſo called, of Twenty ſix, Seven whereof belong to the *Tarſus*, Five to the *Metatarſus*, and Fourteen to the *Toes*. We ſhall treat of theſe more at large in the Fourth Book.

Of the CARTILAGES *in General.*

'Tis uſual to treat of the *Cartilages* next to the Bones, becauſe they approach in their Nature neareſt unto them, perform the ſame Functions in certain Parts of the Body, and oftentimes are changed into Bones.

A Cartilage, according to *Diemerbroeck*, is a ſimilar Part, cold, moderately dry, void of Senſation, generated out of the viſcous and terreſtrial Part of the Seed, and deſigned for

the Support of many of the ſofter Parts, and to check and fruſtrate the violent Efforts and Effects of ſuch hard external Things, as may prove injurious to them.

'Twas upon this Score, that their Subſtance was to be light, ſmooth and flexible, exceeding in Hardneſs the Ligaments, but much ſofter than the Bones. If in theſe Cartilages the Terreſtrial Particles become predominant over the Viſcous, they acquire a greater degree of Solidity, which eaſily turns into Bone; as we ſee it does in the *Sternum*, in the *Spine* of the Neck, and in divers other Parts where it often turns into an oſſeous Subſtance. But when the viſcous Particles get the upper Hand of the Terreſtrial, they never become Oſſeous; as it is obſervable of the Joints of the Arm, of the Thigh, *&c.* But if theſe Particles remain in an equal Mixture, ſo that neither of them has any Predominancy over the other, and that nevertheleſs they grow exceeding dry, either by Age, or by the natural Qualifications of its Nouriſhment, then the Subſtance of the *Cartilage* becomes hard ſometimes, and contrary to its natural Qualities turns into Bone; as may be ſeen in the *Cartilago Enſiformis*, and the *Arteria Trachæa*. *Cordan* has given us a remarkable Inſtance of this kind, in a Thief that was hang'd on a Gibbet at *Milan*, without being ſuffocated, becauſe his *Arteria Trachæa* was not only become very hard, but alſo turn'd altogether into a boney Subſtance.

There is alſo a conſiderable Difference betwixt the Cartilages in reſpect either of their Magnitude, Poſition, Connexion, Uſe and Solidity of their Subſtance, or elſe in that ſome cover the Head of the Bones, and render them of an eaſie Motion: And others conſtitute the Parts themſelves; as thoſe in the Ears and Noſe: Others are plac'd before ſome noble Parts to ſerve them as a Rampier and Defence, as the Cartilages of the Ribs and of the *Sternum*.

The Cartilages are alſo of various Figures, which moſt commonly have their Denominations from ſuch Things unto which they bear the neareſt Reſemblance. Thus, one of theſe *Cartilages* is call'd the *Annular*, becauſe of its being ſhaped like a Ring; another, *Xiphoides*, becauſe it is pointed like a Sword or Dagger; and another, the *Scutiformis*, becauſe it is made like a Buckler; and ſo of divers others.

The Cartilages have commonly their Connexions with the Bones; nevertheleſs there are ſome that are not aſſociated with the Bones, as thoſe of the *Larynx* and the Eyelids.

The Cartilages have not any conſiderable Cavities like the Bones, neither are they nouriſh'd by any Marrow; for they being of a ſoft Subſtance, and full of large Pores, the Nouriſhment eaſily penetrates into their Subſtance on all Sides; or, as ſome will have it, they have a certain Mucoſity of a viſcous and flexible Subſtance, which ſurrounds and preſerves them.

They are deſtitute of Senſation, having neither Membranes nor Nerves; which is ſo much the more advantageous to Men, conſidering that they have Parts enough about them that are ſubject to Pain, without being troubled with theſe; which would have occaſion'd continual Pains in every Motion they are obliged to make.

The Uſe of the Cartilage are, (1.) To prevent the Bones from hurting one another by their mutual Colliſions. (2.) To facilitate and eaſe the Motions of the Parts in their Articulations; and therefore, in living Bodies they are moiſten'd with a certain unctuous Humour, which renders them ſlippery, and conſequently of an eaſie Motion. (3.) To join the Bones together by a *Synchondroſis*. (4.) To defend ſeveral Parts from external Injuries. (5.) To contribute in a great meaſure toward the well-ſhaping or forming of ſeveral others; as, the Noſe, the Ears, the *Arteria Trachæa*, and the Eyelids. (6.) To enlarge the Cavities of the great Joints.

All the Bones that have any Articulations, are inveſted in their Joints with a Cartilage, which is leſs or more Viſcous and Slippery, according as the Motions for which the Bone is deſign'd is either quick or ſlow, or great or ſmall.

We ſhall in convenient Time and Places treat of the Cartilages of the *Larynx*, of the *Epiglottis*, of the *Arteria Aſperia*, of the *Eyelids*, of the *Ears*, of the *Noſe*, and divers others, unto which I will refer my Reader.

Of the LIGAMENTS *in general.*

Next to the Cartilages, 'tis fit we ſhould treat alſo of the Ligaments, it being by the Means of thoſe, that the Bones are join'd and faſten'd to one another. The Ligament is a ſimilar Part, cold, dry and ſolid, and nevertheleſs laxe and flexible, deſign'd to tie the ſeveral Parts together.

'Tis the common Opinion, that the Ligament is made of the viſcous and tenacious Part of the Sperm or Seed; whence it is, that its Subſtance is both ſolid and white. It is a kind of *Medium* betwixt a Cartilage and a Membrane, being harder and ſtronger than a Membrane, that it may not eaſily break; and ſofter than a *Cartilage*, to the end it may be the more pliable, and the better follow the Motions of the Muſcles.

Among the Ligaments, ſome are very ſtrong, ſuch as are plac'd in the interior Interſtices of the Bones; ſome thick and round, which are call'd Cartilagineous: Such is that which ariſes at the Head of the *Femur*, and is inſerted into the *Os Iſchium*. Others are thin, and Membraneous: Theſe cover the Bones on the Outſide; ſuch is that which encloſes the Joint of the *Humerus*.

They are of different Figutes; ſome are Large, and theſe are call'd *Membranous Ligaments*; others round, and are call'd *Nervous*. Theſe Names have been given them for no other Reaſon, but becauſe ſome of them bear a Reſemblance to the Membranes, others to the Nerves; but not becauſe the Ligament is actually either Membranous or Nervous.

The Ligaments which tie the Bones together have no Senſation, for fear that Mankind might ſuffer continual and troubleſome Pains in the Motions of the Bones, which would render the Life of Man exceeding Unhappy. Some nevertheleſs are of Opinion, that there are certain Ligaments which take their Riſe from the *Perioftea*; whence it is that they are in ſome meaſure Membranous, and have alſo ſome Senſation, tho' it be very little. There are alſo ſome other Ligaments which have a Senſation, tho' they have not their Origin from the *Perioſteum*. Of this Kind are thoſe that faſten the *Matrix*, the Liver, the Bladder, *&c.* to their adjacent Parts.

The Ligaments are not nouriſh'd by the Marrow, as *Columbus* and many others have imagin'd; but by the Blood, which is carried to them by means of the Capillary Arteries, which are ſo ſmall as not to be diſcover'd by the Eye.

They take their Riſe either from a Bone, or from a Cartilage, or from a Membrane, and have alſo their Inſertions there.

Their Uſe is to ſerve not only to tie the Bones together, as the Ancients believed it was, but they contribute alſo more to the Motion of the Limbs than the Muſcles, according to the Opinion of our Modern Naturaliſts: Becauſe theſe ſmall *Tubuli*, whereof they are compoſed, being very ſtrait and cloſe, whenever their Figure happens to be never ſo little alter'd by the Motion of the Limbs, the *ſubtile Matter* which paſſes thereupon through the Pores of theſe *Tubuli*, which are ſtraightned, and drawn together, cannot exert its Force to alter their Motion, without extending theſe ſmall *Tubuli*, and reducing them to their former Poſition.

And to ſhew that the Elaſtick Vertue of the Ligaments, as well as ſome other ſuch-like Parts, does conſiſt in nothing elſe, but in the ſmallneſs of their Pores; pray conſider, ſay they, if you beat in the Cold a Plate of Steel, it acquires a Quality of making certain Efforts it had not before. And here it is evident, that nothing elſe has been done in this Action, than to make the Parts to approach cloſer to one another; and at the ſame time to introduce an Auguſtation of the Pores: Whence it is manifeſt, that it is only in the ſmallneſs of the Pores of the ſolid Body you muſt look for the Elaſtick Vertue.

We ſhall have Occaſion hereafter to ſpeak of the Ligaments in particular, when we ſhall treat of the Situation and particular Uſes of each of theſe Ligaments.

Plate the. 2.d

Fig: I

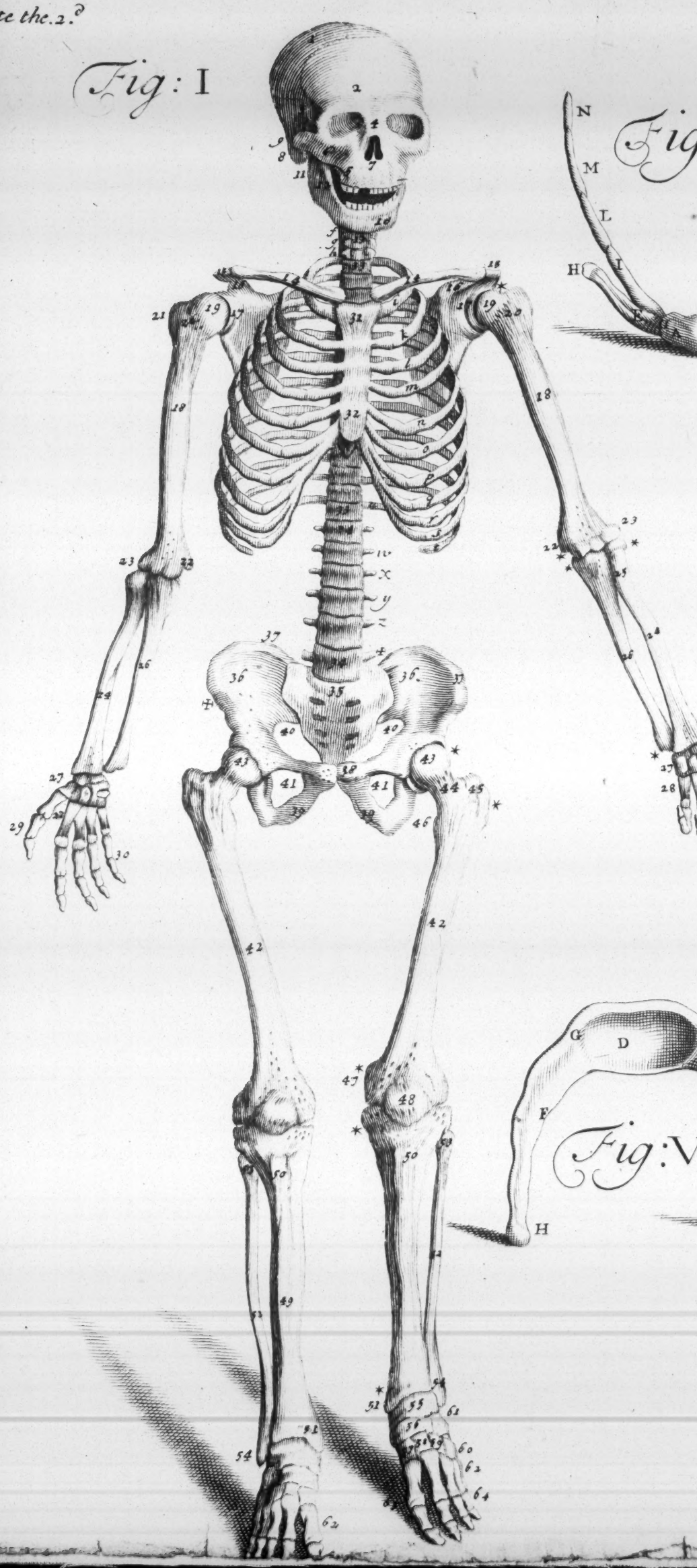
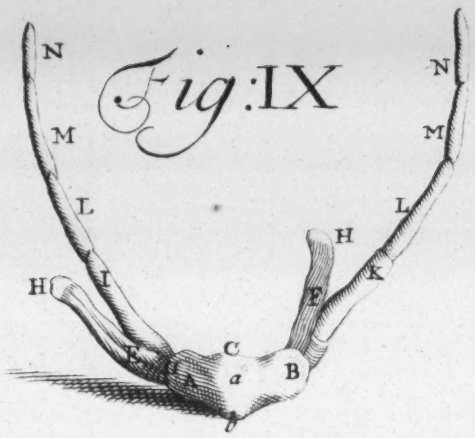
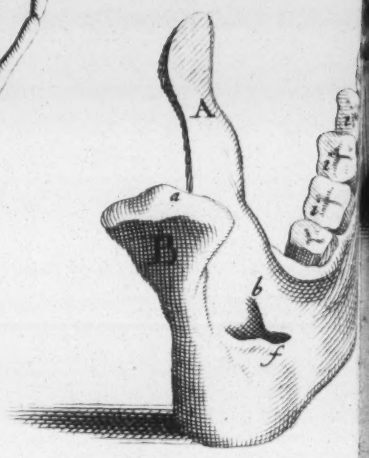


Fig: IX





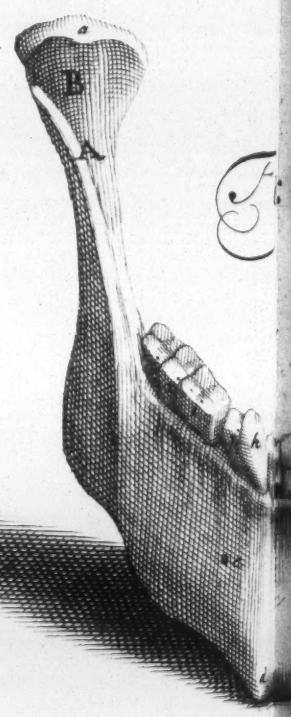
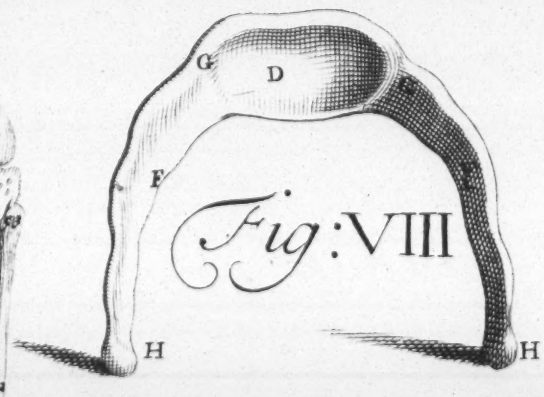


Fig: VIII



Ian. Bones from Sp

Fig: V

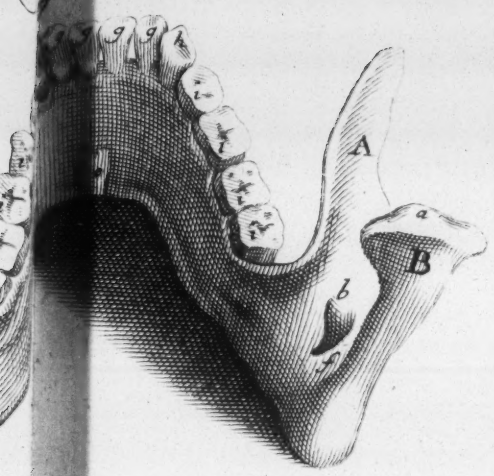


Fig: IV

Fig: III

Fig: II

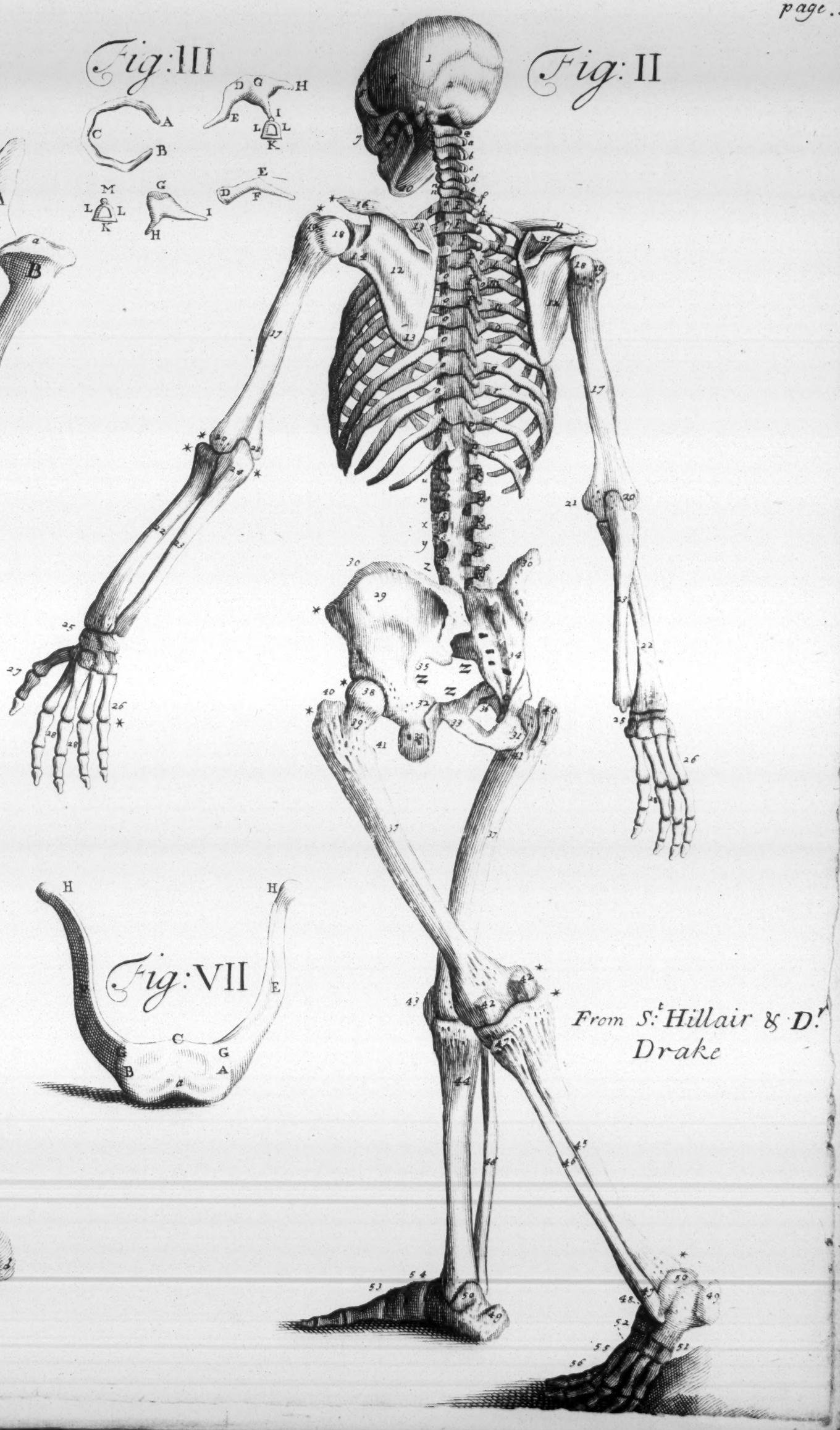
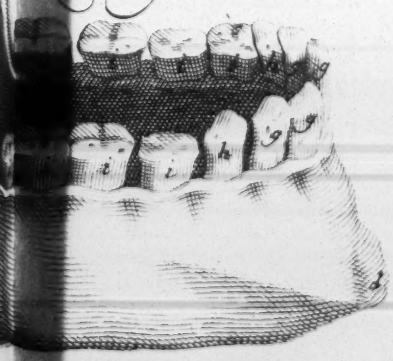


Fig: VII

Fig: VI



From S.t Hillair & D.r Drake

Spigelius

The Two following FIGURES are taken out of Dr. *Drake*'s Anatomy.

An Explanation of FIGURE I. *being the Fore Part of the Skeleton of a Man.*

1 THE *Os Sincipitis*, or *Bregma*.
2 The *Os Frontis*.
3 The *Os Temporum*, or *Squamoſum*.
4 The Two Bones of the Noſe.
5 The Fourth Bone of the Upper Jaw.
6 The Firſt Bone of the Upper Jaw, or Cheek-Bone.
7 The *Septum Narium*.
8 The *Proceſſus Maſtoides*, or *Mammiformis*.
9 The *Os Jugale*.
10, 11, 12 The Lower Jaw-Bone: 10. That Part call'd the Chin; 11. Its poſterior Proceſs that is articulated to the *Os Temporum*, call'd *Condylus*; 12. The anterior Proceſs, call'd *Corone*.
13 The Bodies of the Two inferior *Vertebræ* of the Neck.
f, *g*, *h* Their tranſverſe Proceſſes.
14 The *Clavicula*.
15 The *Spina Scapulæ*.
16 The *Proceſſus Coracoides Scapulæ*.
17 The ſhort Proceſs of the *Scapula*.
18, 19, 20, 21, 22, 23 The *Os Humeri*, or Shoulder-Bone.
18 That Part of it where the *Deltoides* Muſcle is inſerted.
19 Its Head, that is articulated with the Shoulder-Blade.
20 The Aſperity where the *Muſculus Subſcapularis* is inſerted.
21 A *Sinus* in the upper Part of the Shoulder-Bone, that receives the external tendinous Part of the *Muſculus Biceps*.
22 The internal Protuberance of the lower Part of the *Os Humeri*, whence the Two Muſcles bending the *Carpus*, the *Pronator Radii teres*, *Palmaris*, and *Muſculus Perforatus*, of the Fingers do ariſe.
23 The External Protuberancy of the laſt named Bone; whence the Muſcles extending the *Carpus* and *Fingers* ariſe.
24, 25 The *Radius*: 24 Its Prominency to which the large Tendon of the *Muſculus Biceps* is inſerted.
26 The *Ulna*.
27 The Eight Bones of the *Carpus*.
28 The Four Bones of the *Metacarpus*.
29 The Three Bones of the Thumb, with their *Oſſa Seſamoidea*.
30 The Bones of the Fingers, compoſed of Twelve Bones, of which, Three belong to each Finger.
31 The upper Part of the *Os Pectoris*, or *Sternum*.
32 The lower Part of the *Os Pectoris*, or *Cartilago Enſiformis*, which is ſometimes bifid, as it appeared in that Subject from whence this Figure was drawn.
33, 33 The *Vertebræ* of the Back or *Thorax*.
34, 34 The *Vertebræ* of the Loins.
i, *k*, *l*, *m*, *n*, *o*, *p*, *q*, *r*, *ſ*, *t*, *u* The Twelve Ribs.
w, *x*, *y*, *z*, +- The tranſverſe Proceſſes of the *Vertebræ* of the Loins.
35 The *Os Sacrum*.
36, 37, 38, 39 The *Os Innominatum*, by ſome call'd *Coxendix*.
36, 37 That Part of it call'd *Ilium*; 36 Its external concave Part, and, 37 Its Spine.
38 The *Os Pubis*, or *Pectinis*.
39 The *Iſhium*, where it is join'd to the laſt named Bone.
40, 40 The great *Sinus*'s of the *Oſſa Ilium*, and Circumſcription of the *Pelvis Abdominis*.
41 The *Foramen* of the *Iſhium* and *Os Pubis*.
42, 43, 44, 45, 46, 47 The *Os Femoris*, or Thigh-Bone: 43 Its Head, which is received into the *Acetabulum*, or *Cotyle* of the *Os Innominatum*; 44 The Neck of the Thigh-Bone; 45 The great *Trochanter*; 46 the leſſer *Trochanter*, where the *Muſculus Pſoas* and *Iliacus Internus* are inſerted; 47 The lower and internal Head of the Thigh-Bone, to which the ſtrong Tendon of the *Muſculus Triceps* is implanted.
48 The *Mola* or *Patella*, call'd by ſome the *Rotula*.

49, 50, 51 The *Tibia:* 49 A Prominency on its upper Part, where the Tendons of all the extending Muſcles of the Leg are inſerted; 51 The *Malleolus Internus.*

52, 53, 54 The *Fibula*; 53, 54 Its ſuperior and inferior Appendix.

55 The *Aſtralagus.*

56 The *Os Cymbiforme.*

57 The *Os Cuneiforme Majus ſeu Internum.*

58 The *Os Cuneiforme Medium.*

59 The *Os Cuneiforme Externum.*

60 The *Os Cubiforme.*

61 Part of the *Os Calcis.*

62 The Five Bones of the *Metatarſus.*

63 The Two Bones of the great Toe.

64 The Twelve Bones of the leſſer Toes, of which, Three compoſe each Toe.

* * * * The *Appendices* of the *Spina Scapulæ*, *Os Humeri*, *Radius*, *Ulna*, *Os Femoris*, and *Tibia.*

The Explanation of FIGURE II. *being the Back and Side of the Skeleton of a Woman.*

1 The *Os Sincipitis.*

2 The *Os Occipitis.*

3 The *Proceſſus Mammiformis.*

4 The *Os Squamoſum.*

5 Part of the *Os Sphenoides.*

6 The *Os Jugale.*

7 The Firſt Bone of the Upper Jaw.

8 Part of the Fourth Bone of the Upper Jaw.

9, 10 The lower Jaw-Bone: 10 The internal Part of it, where the *Muſculorum par Geniohyoideum* and *Genioglosſum* do ariſe.

11 Part of the *Clavicula.*

12, 13, 14, 15, 16 The *Scapula*, or Shoulder-Blade: 13, 13 Its *Baſis*; from 13 to 14 Its *Coſta Inferior*; 14 Its *Proceſſus Brevis*; 15 Part of the *Proceſſus Caracoides* on the left Side *in Situ*; 16 The *Spina Scapulæ.*

17, 18, 19, 20, 21 The *Os Humeri:* 17 That Part of it where the *Muſculus Brachiæus Externus* begins to ariſe; 18 The Head of the *Os Humeri*; 19 The Aſperity of the *Humerus*, where the *Muſculi Supraſpinatus*, *Infraſpinatus*, and *Teres Major*, are inſerted; 20 The external Protuberancy, whence the *Muſculi Extenſores* of the *Carpus* and Fingers ariſe; 21 The External Protuberance of the *Os Humeri*, where the *Muſculi* bending the *Carpus* and Fingers ariſe.

22 The *Radius.*

23, 24 The *Ulna:* Its ſuperior Part call'd the *Olecranon*, or the Elbow.

25 The Eight Bones of the *Carpus.*

26 The Four Bones of the *Metacarpus.*

27 The Three Bones of the Thumb.

28 The Bones of the Fingers.

+ The Firſt *Vertebra* of the Neck, wanting a Spinal Proceſs.

a, b, c, d, e, f The Spinal Proceſſes of the other Six *Vertebræ* of the Neck, of which, the Five ſuperior are double, betwixt which are placed the *Muſculi Interſpinales Colli.*

n, n, n, n The tranſverſe Proceſſes of the *Vertebræ* of the Neck.

h, i, k, l, m, n, o, p, q, r, ſ, t The Twelve Ribs.

o, o, o, The tranſverſe Proceſſes of the *Vertebræ* of the *Thorax.*

P, P, P, &c. Their Spines.

R, R, R, &c. The Spines of the Five *Vertebræ* of the Loins.

S, S, S The tranſverſe Proceſſes of the *Vertebræ.*

u, w, x, y, z The Bodies of thoſe *Vertebræ.*

29 The back Part of the *Os Ilium*; by ſome call'd *Dorſum Ilium.*

30 The Spine of the *Ilium.*

31 The Protuberance of the *Os Iſhium*, whence the Muſcles bending the Leg do ariſe; to wit, the *Seminervoſus*, *Semimembranoſus*, and one of the Heads of the *Biceps*; together with the *Quadratus Femoris*, which latter is an *Obturator.*

32 An acute Proceſs of the *Iſhium*, betwixt which and the laſt mentioned Protuberancy (31) the Tendons of the *Muſculus Marſupialis* paſs, as on a Pulley.

33 The Internal of the *Os Pubis.*

34 The *Os Sacrum:* *O* The *Os Coccygis.*

+ The Difference between the *Os Sacrum*, *Ilium*, and *Pubis*, is here remarkable, being much greater in Women than in Men.

35 The large *Sinus* of the *Os Ilium*, wherein the *Muſculus Pyriformis* paſſes to its Termination.

36 The great *Foramen* of the *Iſhium.*

37, 38, 39, 40, 41, 42 The *Os Femoris*. 37 The *Linea Aſpera*; 38 Its Head, that is receiv'd into the *Acetabulum* of the *Coxendix*; 39 The Neck of the Thigh-bone: 40 The *Trochanter Major*, to which divers Muſcles are inſerted; 41 The leſſer *Trochanter*; 42 The Two Interior Protuberencies of the lower *Appendix* of the Bone.

43 Part of the *Patella Inſitu*.

44, 45 The *Tibia*; 44 That Part of the Left where the *Muſculus Sartorius*, *Gracilis* and *Seminervoſus*, are inſerted.

46, 47, 48 The *Fibula*; 47, 48 Its ſuperior and Inferior Appendices.

49 The *Os Calcis*.

50 The *Aſtrolagus*.

51 The *Os Cuboides*.

52 The Three *Oſſa Cuneiformia*.

53 The *Os Cuneiforme Majus*.

54 The *Os Cymbiforme*.

55 The *Oſſa Metatarſi*.

56 The Bones of the Toes.

* * * &c. The Appendices of the *Spina Scapulæ*, *Os Humeri*, *Radius*, *Ulna*. *Oſſa Metacarpi*, *Os Ilium*, *Femoris* and *Tibia*.

The Seven Figures explain'd in the next following Tables, are taken out of *Spigelius* his *Hiſtory of the Bones*.

FIGURE III. *repreſents the Three ſmall Bones of Hearing: Firſt, as they are conjoin'd together, and afterwards ſeparately, which ſhews their Connexion, natural Figure, and Magnitude; as alſo the Oſſeous Circle ſeparated from the* Os Petroſum.

A, B, C The Oſſeous Circle, the beginning of which is mark'd with *A*, the Extremity *B*, and its middle Circular Part with *C, D, E, F*. The firſt of theſe ſmall Bones is call'd the *Malleus*, the Head of which is mark'd with *D*, its large Proceſs with *E*, and its leſſer Proceſs with *F*.

G, H, I The ſecond of theſe Bones, call'd the *Incus*, the broad *Baſis* of which is mark'd with *G*, its ſhort and thick Leg with *H*, and its long and ſmall with *I*.

K, L, L, M The *Stapes*, the *Baſis* of which is mark'd with *K*; its Two Legs or Divarications with *L, L*, and its Point or Head with *M*.

FIGURE IV, V, *and* VI. *repreſents the Inferior* Maxilla *Three different Ways*; (1.) *Its Anterior Part*: (2.) *Its Poſterior*: *And* (3.) *Its Lateral Parts*.

A, A The Anterior Proceſs, call'd *Corone*, into which the *Muſculus Temporalis* is inſerted.

B, B, The Poſterior Proceſs, which with its ſmall Head is inarticulated with the *Proper Sinus* of the *Os Temporum*.

a, a The ſmall Head which is Inarticulated.

b, b, 3, 4 Two *Foramina* on the interior Surface near the Origin of the ſaid Proceſſes, through which the Third Branch of the Fourth Pair of Nerves of the Brain, in Conjunction with a Vein and Artery, take their Paſſage into the Cavities of the Teeth.

c, c, 2, 4 The *Foramina*, through which theſe Veſſels paſs out of the ſaid *Maxilla* again, and are diſperſed into the lower Lip, and the Muſcles that are plac'd thereabouts.

d, 2, 4 The firſt Prominency or Inequality of this Bone, where the Muſcles which draw downwards the under Lip, have their Originations.

e, 3 The Second Prominency, into which is inſerted the Tendon of the *Muſculus Maxillam Deprimens*, and where the other Muſcles of the Tongue have their Originations.

f, 3 The Third Prominency, where the *Abductor Maxillæ* takes its Riſe.

g, h, i Shew the Three different Diſpoſitions of Teeth; *g* The Four *Inciſores*; *h* The Two *Canini*; and, *i* The Ten *Molares*.

FIGURE

FIGURE VII, VIII, *and* IX. *repreſents the* Os Hyoides; *the Firſt, its Anterior Part; the Second, its Poſterior; and the Third, at the ſame time, its* Lateral *and ſmall Bone, by which it is conjoin'd with the* Proceſſus Styloides.

A, B The *Baſis* of the *Os Hyoides.*

a, 6, 8 The Prominency of the Anterior Part.

C, 6, 8 The Tranſverſe and Oblong *Sinus*, which receives the firſt Pair of the Muſcles of the *Hyoides.*

b, The Inferior *Sinus.*

D, 7 The Concavity of the *Baſis* of the *Os Hyoides.*

E, F The Inferior *Latera* or *Cornua* of the *Os Hyoides*, which make the Second and Third ſmall Bone.

G The Connexion of the *Cornua* with the *Baſis.*

H, H The Point of the *Cornua* which is conjoin'd with the *Cartilago Scutiformis* of the *Larynx.*

I, K, 8 The Superior *Latera* of the *Os Hyoides*, which are ſlenderer and rounder than the Inferior.

L, M, N Three other ſmall Bones, which are moſt commonly conjoin'd on both Sides with the Superior *Latera.*

The following Account of the Bones, is taken from Monſieur Le Clerk, *Phyſician in Ordinary to the* French *King, his* Exact and Compleat Oſteology: *The Firſt Chapter treating* of the Bones in General, *has been quite omitted, that Part having been ſufficiently treated of before.*

CHAP. II.

Of the Bones of the HEAD.

THE Head is divided into the *Skull*, and *Face.*

The Skull is a Compoſition of ſeveral oſſeous Pieces, which form a Cavity that contains the Brain, the *Cerebellum*, the *Medulla Oblongata*, &c.

The Bones of the Skull are compoſed of Two boney *Lamina*, call'd *Tables.* The Exterior is ſmooth, and cover'd with the *Pericranium*; but the Interior is uneven and unequal, by reaſon of divers Aſperities, Cavities and Ridges, which are imprinted in it by the Pulſe of the Arteries of this Membrane. Theſe Two *Tables* emit many oſſeous Fibres or Threads, which make abundance of ſmall Cells, containing a porous Medullary Subſtance, interſperſed with many Caruncles, and an infinite Number of Veſſels. This is call'd the *Diploe*, or the *Medullium.*

The

The *Meditullium* does not differ from the Marrow of the other Bones, being only somewhat more red, by reason of its sanguineous Vessels. Its Use is also the same with the Marrow of the other Bones.

The Two *Tables* of the Skull are hard and solid, but what lies betwixt them is porous, spongious, and fill'd with Marrow. The Bulk and Figure of the Skull is answerable to the Brain: The Head it self is of an oblong Figure, rais'd before and behind, but flattish on the Sides.

There is a Twofold Connexion or Articulation to be observ'd in the Head; to wit, one of the whole entire Head with the Neck, and the other of the Pieces with one another.

The *First* is that which is made with the first *Vertebra* of the Neck by a double *Arthrodia*, which has a Relation to the second Sort of the *Ginglymus*; because the Two Prominencies of the *Os Occipitis* are received into the Two Cavities of that *Vertebra*; and by this Articulation it is, that the Flexion and Extension of the Head, or its Motion both before and behind, is made.

The *Other* Articulation is made with the Second *Vertebra* of the Neck, by the Means of a small *Apophysis* of this *Vertebra*, which is receiv'd into a Cavity of the first *Vertebra*, and upon a small Prominency of the *Occiput*. 'Tis by this Articulation that the oblique and semicircular Motions of the Head are made; which making but one Body with the first *Vertebra*, turns round its Axel-Tree; whence it has obtain'd the Name of the *Axis*.

According to the Ancients, the second Sort of Articulation of the Head, or rather of the Connexion of all its different Parts or Pieces with one another, is made by Three Sorts of a *Synarthrosis*; to wit, the *Suture*, *Harmonia* and *Gomphosis*. But the Moderns say, there is no such Thing as an *Harmonia*. All the Bones of the Skull are articulated by the Sutures, which the Anatomists distinguish into *Common* and *Proper*: The *Common*, are those that articulate the Bones that are common both to the *Skull* and to the *Face*.

Of the *Common* Sutures, there are Three; the *First*, is the *Sutura Sphenoidalis*, having obtain'd its Name from the *Os Sphænoides*, which it surrounds: The Second, the *Ethmoidales*: And the Third, the *Zygomtica*, which divides the *Zygoma* into Two, and the other Bones of the Face, from those of the Skull.

The *proper* Sutures are subdivided into *true*, and *false*, or *spurious* Sutures: But the Modern Anatomists admit of no spurious Sutures; because all the Bones of the Skull are articulated by way of Indenting, like the Teeth of a Saw, as in the *Ossa Temporum*, which they alledge as an Instance of the *false* Suture, which the Moderns say are articulated by scaly-like Sutures, being plac'd one upon another like the Scales of a Fish.

So that the *proper* Sutures are all of them *true*, and Four in Number; to wit, the *Sutura Coronalis*, the *Sagittalis*, the *Lambdoides*, and the *Temporalis*.

The *Coronalis* has its Beginning near the great Angle of the Eye, traverses the Orbit, and takes its Course to the uppermost Part of the Head, from whence it again takes the same Course on the other Side to the great Angle. The *Sagittalis*, so call'd from its straitness, passes in a strait Line from the *Lambdoides* to the *Coronalis*, and sometimes stretches down to the Root of the Nose. The Place where this Suture and the *Coronalis* meet, is call'd the *Fontanella*.

The *Suture Lambdoides* incircles the whole *Os Occipitis*. In it, there are to be observ'd many small Bones, like Wedges, which serve to unite it the straiter and more closer together.

The *Temporalis* or the *Scaly*, conjoins the *Ossa Temporum* with the *Parietalia*.

The Sutures articulate the Bones of the Skull, they give Passage to many small Vessels; they prevent the Fracture of one Bone from penetrating into another adjacent Bone, they facilitate the Delivery of the Circle, by affording Liberty to all the Pieces of the Skull to lap or pass one over the other.

The Bones of the Skull are distinguish'd into the *Containing*, and the *Contained*. The *Contained*, are the Four several Bones of Hearing; to wit, the Anvil, the Hammer, the Stirrop, and the orbicular Bone. The *Containing*, are either *Common*, or *Proper*: Of the *Common* (so call'd, because they belong both

to

to the Skull and to the Face) there are Two; to wit, the *Os Sphænoides*, and the *Ethmoides*; unto which we ought to add alſo, the *Coronale*, becauſe it forms the whole *Front* or Forehead, and the ſuperior Part of the *Orbit*.

Of the *Proper*, there are *Six*, or rather *Five, viz.* if you reckon the *Os Coronale* among the *Common*; to wit, the *Os Occipitis*, the Two *Parietaria*, and the Two *Oſſa Temporum*.

Of the OS FRONTIS, *or the* CORONALE.

The *Os Frontis* forms the ſuperior and anterior Part of the Head: Its Subſtance is moderately ſolid, harder than that of the *Parietaria*, and not quite ſo hard as that of the *Occiput*. Moſt commonly it conſiſts only of one Bone; though ſometimes alſo it is divided into Two Parts by the *Sutura Sagittalis*. It is the largeſt among all the other Bones of the Skull.

The *Sinus's* that are ſituated above the Eye-brows, one on each Side of the Noſe, are Two large Cavities within the Interſtice of the *Os Frontis*, and inveſted with a Membrane, which is interſperſed with an infinite Number of ſmall Glandules, from whence there flows continually a certain Mucoſity, which paſſes into the Noſe by certain Holes: Of which, we ſhall ſay more hereafter.

The Ancients were of Opinion, That this mucous Humour did fall immediately from the Brain through the *Os Cribroſum*; but it comes immediately from theſe *Sinus's*.

In thoſe that have a flat Forehead, theſe *Sinus's* are fill'd up with an oſſeous and ſpongeous Matter, being in all Reſpects like to the *Meditullium*, which is betwixt the Tables of the Bones of the Skull; which perhaps may be the Reaſon why ſome People are obliged to blow their Noſes oftner than others.

Theſe Two Caverns are ſeparated one from the other by a very ſlender oſſeous Lamel, placed tranſverſedly, reaching from above downwards to the Root of the Noſe. Sometimes this Lamel does not make an entire Separation betwixt theſe *Sinus's*, and it is in caſe of this Defect, That they have a Communication one with the other. But when there is an entire Separation betwixt theſe *Sinus's*, there is moſt commonly a Perforation in this oſſeous Partition, which affords a mutual Communication to thoſe *Sinus's*; ſo that the Mucoſity may paſs from one of theſe Cavities into the other: Perhaps, that in caſe it ſhould be too thick in one, (which would prevent its Defluxion into the Noſe) it might be render'd more fluid by its being mix'd with that of the other *Sinus's*.

Sometimes theſe Caverns are ſo large, as to reach to the very Middle of the Forehead, and even do ſtretch above all the ſuperior Part of the *Orbit*: Then theſe Caverns are ſeparated into many ſmall Cells, by ſome oſſeous Lamels, which are extreamly ſmall and thin. 'Tis very probable, That ſuch People as have theſe *Sinus's* very large, are obliged to blow their Noſes much oftner than others; for the larger they are, the more Glands they contain.

In each of theſe *Sinus's*, on the Side of the Root of the Noſe, there is a Perforation that penetrates into the Cavity of each Noſtril, betwixt the ſpongious Lamels of the Noſe, through which the mucous Humour falls from theſe *Sinus's* into the Noſe.

Sometimes it happens, that there is a Perforation only in One of theſe *Sinus's*, and then the Mucoſity of that *Sinus* which is imperforated, paſſes into the other *Sinus* through the Hole that is in the Partition, and thus falls into the Noſe, together with that of the perforated *Sinus*. If you propoſe to have a View of theſe *Sinus's*, and of what is contained within them, you muſt diſſect this Bone, by the Help of a Saw, from its Beginning at the Top down to the Root of the Noſe. Great Care ought to be taken not to make uſe of the *Trepan* upon that Place where theſe *Sinus's* are ſituated.

It ſeems as if the Stoppage of the Noſe owes its Origin to the Stoppage of the *Foramina* of theſe *Sinus's* that open into the Noſe; but I am of Opinion, that this Indiſpoſition is to be attributed rather to an Obſtruction in the Lamels of the Noſe, and the Membranes that inveſt them.

The *Brows* are Two Arches placed juſt above the Orbits of the Eyes, upon which are planted the Hairs, which are called the Eye-brows. Each of theſe Arches begins at the

the Root of the Noſe, and ends near the Temples.

That Part which is next to the Noſe is call'd the *Head* of the Eye-brow, and the other Part next to the Temples is the *Tail*.

Near the Root of the Noſe, upon the Edge of the Arch that forms the Eye-brows, there is a ſmall *Foramen* or Hole, and ſometimes Two, and ſometimes only a Chink, through which, as Mr. *Vieuſſens* has obſerved, paſſes an Artery, and Two Branches of the Fifth Pair of Nerves, one whereof comes from the *Optick*, and the other from the ſuperior *Maxillary*, and are diſperſed through the *Muſculus Frontalis*.

Juſt on the Side of this Hole there are ſometimes to be obſerved Two other ſmall Holes, which penetrate in a ſtrait Line quite through the Firſt Table to the ſpongious Part, and give Paſſage to the ſanguineous Veſſels that come from the *Curotides* and the internal *Jugulars*.

The interior *Orbita* is a very ſmall Hole, ſituated in that Part of the *Os Planum* which forms the lateral Part of the Orbit on the Side of the Noſe, a little below the *Os Frontis*, through which paſſes a Branch of the Optick Nerve, which takes its Courſe above the *Criſta Galli*, and thence to the *Os Ethmoides*.

The ſuperior Part of the *Orbita* is form'd by the inferior Part of the *Os Frontis*.

The great Angle of the Eye is form'd partly by that Part of the *Os Frontis* which forms the ſuperior Part of the Orbit, near the Root of the Noſe.

The leſſer Angle of the Eye is form'd partly by that Part of the *Os Frontis* that forms the ſuperior Part of the Orbit, next to the Temples.

In the ſuperior Part of the Orbit, under the Tail of the Eye-brows, towards the leſſer Angle, is a Cavity in which the ſuperior lacrymal Gland is lodged, being of ſuch a Bigneſs, that you may lay the End of your Thumb in it. From this Gland diſtil the Tears, which ſpread themſelves all over the Ball, or the Eye-Apple.

Juſt at the Root of the Noſe, upon the Head of the Eye-brows, is faſten'd on each Side a ſmall Muſcle, the Fibres of which are loſt among the Fibres of the *Muſculus Frontalis*. 'Tis this ſmall Muſcle that makes the Eye-brows to draw nearer unto one another, as alſo the Skin betwixt the Two Eye-brows from above downwards, when we are ruminating upon ſome difficult Matter.

In the great Angle of the Eye, juſt at the Root of the Noſe, the *Muſculus Orbicularis*, which ſhuts the lower Eye-lid, has its Origination. It covers to the Breadth of an Inch the whole Arch of the Eye-brows, and terminates at the leſſer Angle. This Muſcle does caſt its Fibres into the inferior Eye-lids, by the Angles of the Eyes, to draw them upwards. The *Muſculi Frontales* are ſpread over the whole Surface of the Forehead, and are Two fibrous Membranes, excepting that on the ſuperior and middle Part of the *Frons*, or Forehead, they leave a Space betwixt them; but as they deſcend towards the Noſe, they approach inſenſibly to one another, till they join together; ſo that betwixt the Eye-brows they ſeem to make but one Muſcle, which ſometimes terminates in a Point, and ſtretches over the Ridge of the Noſe to its Extremity. This Muſcle draws the Eye-brows upwards, when we look at ſomething that is above us.

The *Sutura Coronalis* is form'd by the Conjunction of the *Os Frontis* with the Two *Oſſa Parietaria*. It draws a Circle round the whole ſuperior and lateral Part of the Skull.

The *Sutura Coronalis* begins at the leſſer Angle of the Eye, in that Place where the *Os Mali* is articulated with the *Os Frontis*. It aſcends circularly to the Head, and terminates at the leſſer Angle of the other Eye, in that Place where the *Os Frontis* is articulated with the *Os Mali*.

The *common Suture* of the *Skull* and the *Face* begins with the *Sutura Coronalis*, at the leſſer Angle of the Eye, at the Place where the *Os Mali* is articulated with the *Os Frontis*.

The *Suture* that is common to the Face and the Skull, is a Continuity of the *Sutura Coronalis*. It deſcends into the Bottom of the Orbit of the Eye, and aſcends again over the Root of the Noſe: Then it deſcends again into the Bottom of the other Orbit of the Eye, and re-aſcends at the leſſer Angle, at that Place where the *Os Frontis* is articulated with the *Os Mali*, where it ends: So that this Suture is made by the Conjun-

ction of the inferior Part of the *Os Frontis*, with the ſuperior Part of the *Os Mali*; by the Conjunction of the ſuperior Part of the *Os Planum*, with the ſuperior Part of the *Os Frontis*; by the Conjunction of the ſuperior Part of the *Os Unguis*, with the inferior Part of the *Os Frontis*; of the ſuperior Part of the *Os Maxillæ Superioris*, with the inferior Part of the *Os Frontis*; and laſtly, by the Conjunction of the ſuperior Part of the Bone of the Noſe, with the inferior Part of the *Os Frontis*.

To find out the exact Place through which the Longitudinal Suture of the *Frons* is to paſs, in thoſe Skulls where it is not extant; draw a Line from the Beginning of the *Sutura Sagittalis* to the Beginning of the Longitudinal Suture of the Noſe; this being that Part through which it takes its Courſe in young Children, and in thoſe that retain it all their Life-time: But moſt commonly theſe Two Bones are ſo well united together, that they are and appear like one ſingle Bone.

In the inferior and middle Part of the *Os Frontis*, betwixt the Two Eye-brows, there is an Indentation, into which the Two Bones of the Noſe are grov'd.

The *Apophyſis* of the *Os Coronale*, which is articulated with the *Apophyſis* of the great Bone of the Upper Mandible, and forms the great Angle of the Eye, is ſituated on the inferior and middle Part of the *Os Frontis*, on the Side of the Bone of the Noſe.

The *Apophyſis* of the *Os Coronale*, which is articulated with the *Apophyſis* of the *Os Mali*, and forms the leſſer Angle of the Eye, is ſituated at the inferior, lateral, external, and anterior Part of the *Os Frontis*.

After you have ſeparated the Skull by the Saw, you will ſee Two large Dimples or Cavities, which ſerve for a Support to the anterior Lobes of the Brain. Each of theſe Pits is ſituated in the Cavity of the *Os Frontis*, in the inferior and anterior Part; to wit, one on each Side of the *Apophyſis*, call'd the *Criſta Galli*.

In theſe Cavities you may obſerve certain pointed Inequalities, like ſmall Hillocks, which ſupport the anterior Lobes of the Brain: And to theſe Inequalities, the *Dura Mater* alſo is faſten'd very cloſe.

In the inferior and middle Part of the *Os Frontis*, there is a Cleft of the Length of an Inch, into which the *Os Cribroſum* is fixed.

There is a ſmall round Pit, ſhaped like the Bottom of a Sack, into which is fix'd the Extremity of the Logitudinal *Sinus*, in the interior, inferior, and middle Part of the *Os Frontis*, at the Root of the *Criſta Galli*. If this Pit were pierced through, it would terminate in the Cavity of the Noſe; which is the Reaſon why the Ancients did believe, that the Longitudinal *Sinus* did diſcharge it ſelf through this Hole into the Noſe, and did produce there moſt violent Hemorrhagies.

There is a Gutter alſo, into which is fix'd the anterior Part of the Longitudinal *Sinus*. It begins at the Bottom of the Sack, where the Extremity of the Longitudinal *Sinus* is faſten'd, and riſes in a ſtrait Line to the *Sutura Sagittalis*. This Furrow affords Room to the Longitudinal *Sinus*, and prevents its Compreſſion.

On the interior and ſuperior Surface of the *Os Frontis*, you may obſerve divers ſmall Pits, which ſeem to be the Impreſſions of a Finger, into which the *Dura Mater* is very cloſely faſten'd.

There are alſo divers other Cavities or Holes, diſperſed all over the internal and ſuperior Surface of the *Os Frontis*, which ſeem to be made with a Bodkin, into which the *Dura Mater* is ſtill more firmly faſten'd than in the beforeſaid Pits, by the Means of Abundance of ſmall Arteries, which go from the *Dura Mater* to the *Diploe*, and of many Veins which paſs from the *Diploe* to the *Dura Mater*.

There is a ſmall ſuperficial Cavity ſituated at the upper Part of the Orbit, near the great Angle of the Eye, above the *Foramen* of the Eye-brows, into which is faſten'd a cartilaginous Pulley, through which paſſes the Tendon of the *Muſculus Obliquus Major* of the Eye.

The lateral and inferior Part of the *Os Frontis* grows thinner gradually, in the Nature of a Glacis, for the better Union of the ſuperior *Apophyſis* of the *Os Cuneiforme* with it.

The *Os Frontis* has this peculiar to it ſelf, That it begins to turn oſſeous from the Circumference to its Center; whereas the Oſſification of the other Bones begins at the

Center

Center to the Circumference. The Two Firſt Months after the Conception, this Bone is only a Membrane, which in the Third Month begins to harden at the Orbit, and ſo continues to do by the Eye-brows all round the Bone. In the Fourth Month, the whole Bone is in a manner become oſſeous, excepting the Center, which remains as yet Cartilaginous; as alſo that Part which is next to the *Sphænoides* and the Temples. In the Seventh Month, it is all over bony: And in the Ninth, 'tis articulated with the other Bones by Membranes; by the Means of which, the Bones of the Skull do ſlip one over another, to leſſen the Bulk of the Head at the Time of Parturition. At Nine Months, this Bone is ſtill divided in Two by a Suture, which reaches from the *Sutura Sagittalis* to the *Longitudinal* of the Noſe, which ſometimes remains during the whole Life of the Perſon.

The ſmall Teeth which are all round the Extremities of the *Os Coronale*, are indented with the Teeth of the *Oſſa Parietalia*.

The *Os Frontis* is articulated with the Two *Parietalia* on the ſuperior Part of the Skull; with the ſuperior *Apophyſis* of the *Os Cuneiforme* towards the Temples; with the ſuperior *Apophyſis* of the *Os Mali* at the leſſer Angle of the Eye; with Part of the *Os Cuneiforme* in the Orbit on the Side of the leſſer Angle; and at the Bottom of the Orbit, with the *Os Planum* on the Side of the great Angle; with the ſuperior Part of the *Os Unguis*; with the ſmall ſuperior *Apophyſis* of the great Bone of the Mandible, at the great Angle of the Eye; and with the ſuperior Part of the *Os Naſi*. It takes its Courſe from the other Orbit to the *Parietalia*, as we have ſaid before, and accompliſhes its Articulation with the other Bones. The *Os Frontis* is covered with a Membrane of a moſt exquiſite Senſe, which is call'd the *Pericranium*.

Of the OSSA PARIETALIA.

The *Oſſa Parietalia* are Two large quadrilateral Bones, which form the ſuperior and lateral Part of the Skull. Moſt commonly there is a ſmall *Foramen* in each of the *Parietalia*, through which paſs the Blood-Veſſels, which go from the *Pericranium* to the *Dura Mater*, and from the *Dura Mater* to the *Pericranium*. Theſe *Foramina* are placed on the convex Side of the *Parietalia*, at about Two Lines Breadth Diſtance on each Side from the *Sutura Sagittalis*, and about a good Inch's Breadth from the *Sutura Lambdoides*. Sometimes there is but one of them, and ſometimes none at all.

The *Sutura Sagittalis* is form'd by the Conjunction of the Two *Parietalia* at the upper Part of the Head. It begins at the *Os Fronts*, and terminates at the *Os Occipitis*.

Each of the *Oſſa Parietalia* has a broad Angle or Proceſs, which grows ſlenderer by Degrees, in the Nature of a *Glacis*, for the better Connexion with the *Os Squammoſum* of the Temples. This *Glacis* is at the inferior and lateral Part of the *Parietalia*. Certain ſuperficial ſmall Cavities are moſt generally to be obſerved in the Concavity of the Bone, all along the Side of the *Sutura Sagittalis*. They ſeem to be made by the Impreſſions of a Finger: And in theſe Cavities, the *Dura Mater* is faſten'd very cloſe.

Sometimes there are alſo ſome ſmall Holes in the concave Part of the *Parietalia*, which penetrate quite into the *Diploe*. Through theſe, the ſmall Arteries which come from the *Dura Mater* to the *Diploe*, and many ſmall Veins that go from the *Diploe* to the *Dura Mater*, take their Paſſage. Upon the concave Surface of the *Parietalia*, there are certain Tracts, in which are diſperſed the Veſſels of the *Dura Mater*, repreſenting the Fibres of a Fig-Leave; the Stalk beginning upon the great Angles by which the *Os Temporum* is ſupported. Theſe Tracts have been made by the ſanguineous Veſſels of the *Dura Mater*, whilſt the Bones were as yet very ſoft and tender.

The *Oſſa Parietalia*, in a *Fœtus* of Three Months after Conception, ſcarce begin to oſſify; but at Four Months End, they are turn'd quite bony, unleſs it be near the *Sutura Sagittalis*, near the *Os Sphænoides*, and the *Os Temporum*; as alſo near the Aperture call'd the *Fontanella*, where they continue as yet to be membranous, and keep at a Diſtance from one another.

In the Seventh Month, they are already articulated together by a Suture; but ſometimes they continue ſtill ſeparated from the *Os Sphænoides* and the *Oſſa Temporum* by a Mem-

brane, which alſo turns oſſeous in the Eighth Month; and in the Ninth Month they are compleat Bones, excepting that the *Fontanella*, whereof they make a Part, is as yet Membranous till the Tenth Month after the Birth, and ſometimes till the Fifth Year; if it does not diſappear by that Time, it continues to be ſo for all the Remainder of the Perſon's Life.

The *Oſſa Parietalia* are articulated together on their ſuperior Part by the *Sutura Sagitalis* at the Extremity of their great Angle towards the Temples, with the ſuperior *Apophyſis* of the *Os Sphænoides*; with the *Os Coronale* by the *Sutura Coronalis*; with the *Occiput*, by the *Sutura Lambdoides*, and with the *Temporum*, by the *Sutura Squamoſa*.

Of the OCCIPUT, *or* OS OCCIPITIS.

The *Occiput* is a large Bone, almoſt of a circular Figure, which forms the Poſterior Part of the Head. It is very hard, and thick, and unequal on its Exterior Part, for the better faſtening of the ſmall Muſcles that ſerve for the Extenſion of the Head.

In the middle of the *Occiput* there is a large *Apophyſis* or Protuberancy, call'd the *Nucha*, or the Nape.

Immediately below this Protuberancy, to wit, at its Root, ſtick Two Muſcles on each Side call'd the *Trapezi*: They are faſten'd alſo to the Point of all the Spines of the Neck; and to the Root of the Nine firſt Spines of the Back; and to the whole Spine of the *Omoplata* to the Extremity of the *Acromium*, and to the Extremity of the *Clavicula* near the *Acromium*: They pull the *Omoplata* upwards.

Immediately under the Nape, there are moſt commonly to be ſeen Two large ſuperficial Cavities ſeparated from the Upper to the Lower Part by a ſmall Ridge: In both theſe Cavities is fixed the Muſcle call'd the *Complexus*, or the *Trigeminus*, immediately above the *Trapezius*, and is faſtened likewiſe to the tranſverſe *Apophyſis* of the Seventh *Vertebra* of the Neck, and the Five Superior of the Back. It extends the Head.

Juſt by the great *Foramen*, thro' which the Spinal Marrow does deſcend, there are Two ſmall Cavities ſeparated by a Spine or Ridge, reaching from above downwards: In theſe Cavities are placed the *Muſculi recti Minores*, which fill up theſe Cavities, and are faſtned alſo to the Point of the Spine of the Firſt *Vertebræ*; they draw the Head backwards.

On the Side of the Cavities of theſe two *Muſculi recti*, a little nearer to the Ear are placed the *Muſculi recti Majores*, which are faſtened alſo to the Point of the Spine of the Second *Vertebra* of the Neck; they draw the Head backwards.

On each Side of the before-mentioned Two ſuperficial Cavities, which are juſt above the *Nape*, is faſtened the *Muſculus Splenius*, which occupies a pretty large Space in a curved Line, which reaches obliquely from above downwards to the middle and poſterior Part of the *Apophyſis Mammiformis*, and is faſtened alſo to the *Spines* of the Five Inferior *Vertebræ* of the Neck, and of the Five Superior of the *Thorax*; it draws the Head backwards.

On the Side of the *Muſculi recti Majores*, a little lower, and towards the Ear, to the Roots of the *Apophyſis Mamillares*, are faſtened the *Muſculi obliqui Minores*, which have their Inſertion at the Extremity of the tranſverſe *Apophyſis* of the Firſt *Vertebra*; they draw the Head backwards.

Upon the Brink of the Great *Foramen*, thro' which deſcends the Spinal Marrow backwards, there is moſt commonly a ſmall Prominency, which in the Extenſion of the Head, reſts upon another Prominency which belongs to the Firſt *Vertebra*; It ſerves in lieu of a Spine, and prevents the Head from falling too far backwards, which would make too large an Aperture betwixt the *Occiput* and the Firſt *Vertebra*, and cauſe a Compreſſion of the *Medulla Oblongata*.

On each ſide of the Great *Foramen*, thro' which the *Spinal Marrow* does deſcend, there are Two large Protuberances or flat *Condyli*; each of theſe *Apophyſes* is Articulated with each of the Cavities of the firſt *Vertebra* of the Neck: Theſe *Apophyſes* are call'd *Coronides*.

On each Side of the Great *Foramen* of the *Occiput*, to wit, at the Root of the *Apophyſis Coronoides*, there is a Cavity, and ſome Furrows, into which is faſtened the great *Aponeurotick* Ligament which ties the firſt *Vertebra* to the

the *Occiput*, and does incircle the whole Articulation.

On each Side of the *Apophyſis Coronoides* there is moſt commonly a ſmall Prominency, which ariſes upon the Great *Foramen* of the *Occiput*: Upon each of theſe ſmall Prominencies, is faſtened the Ligament that ties the *Dens* or Tooth into the Second *Vertebra* of the Neck.

On each Side of that ſmall Prominency, which is ſituated in the middle of the *Elongation* of the *Occiput*, is faſtened the *Muſculus Subœſophagæus*, which lies altogether upon the tranſverſe *Apophyſis* of the *Vertebra* of the Neck.

Upon the *Anterior* Part of the Brim of the great Hole of the *Occiput*, betwixt the Two *Apophyſes Coronoides*, touches the *Dens* of the Second *Vertebra*, upon which the Head turns like upon a Pivot.

Upon the *Elongation* of the *Occiput*, to wit, before and at the Root of each of the *Apophyſes Coronoides*, there is moſt commonly an Oval, but very Superficial Cavity; into which is faſtned a ſmall Muſcle, which has its Inſertion at the Root of the Tranſverſe *Apophyſis* of the Firſt *Vertebra* of the Neck. This Muſcle makes the Chin approach to the Breaſt.

At the very undermoſt Part of the *Occiput* there is a very large Hole, thro' which paſſes the *Medulla Oblongata*, the *Dura* and *Pia Mater*, the *Spinal Nerve*, which entring the Skull thro' this Hole, is join'd with the Eight Pair: The Internal *Jugular* Veins, and the Internal *Carotides*, do alſo paſs thro' this *Foramen*.

Betwixt the Great *Foramen* of the *Occiput* and the *Vomer*, there is a long *Apophyſis* call'd the *Elongation* of the *Occiput*.

In the middle of this *Elongation* of the *Occiput*, there is moſt commonly to be obſerv'd a ſmall Prominency, unto which is faſtened a large, round and nervous Ligament, which with its other Extremity is ty'd to the ſuperior, anterior and middle Edge of the Firſt *Vertebra* of the Neck. This Ligament prevents the Head from being thrown too far backwards.

There are certain Inequalities at the Root of the *Apophyſis Styloides*; to wit, on each Side betwixt the *Apophyſis Maſtoides* and *Coronoides*, into which is inſerted a Muſcle, which has its Inſertion alſo at the Extremity of the Tranſverſe *Apophyſis* of the Firſt *Vertebra* of the Neck; it makes the Chin move towards the Breaſt.

On the Poſterior Part of the Root of the *Apophyſis Maſtoides* there is a Cavity, into which is faſtened another Muſcle that has its Inſertion at the Point of the Tranſverſe *Apophyſis* of the Firſt *Vertebræ* of the Neck about the ſame Place where the *Obliquus Major* and *Minor* are plac'd. It ſerves to draw the Head a little backwards at the ſame Time it is bent forwards, when we put the Chin upon the Breaſt.

On the Inferior and Lateral Part of the *Occiput*, under that Place where the *Obliquus Major* and *Minor* have their Situation, is faſtened a ſmall Muſcle, which not improperly may be call'd the *Auxiliary Muſcle* of the *Obliquus Major* and *Minor*, becauſe it is Aſſiſtant to them in the Oblique Motion; It has its Inſertion on the Side of a ſmall Prominency, which ſerves inſtead of a Spinous *Apophyſis* to the Firſt *Vertebræ* of the Neck: This Muſcle is ſometimes wanting.

Round the whole Edge of the *Occiput*, you may obſerve, at ſome Diſtance from one another, certain Holes, into which are inchaſed or inclos'd certain oblong ſmall Bones, call'd the *Keys*, which ſerve for the Connexion of the *Occiput* and the *Parietalia*; for theſe *Keys* or ſmall oblong-pointed Bones go from the whole Edge of the *Occiput* to the *Parietalia*, to ſtrengthen their Articulation.

Sometimes there is a large Triangular Bone chaſed into the ſuperior and middle Part of the *Occiput*, which being all round and provided with ſmall Teeth, does form a Suture. Chirurgeons ought to be careful not miſtake this Suture for a Fracture of the Skull.

Sometimes alſo this large Triangular Bone of the *Occiput* is divided in Two by a Suture, which reaches from above downwards: This may alſo be eaſily miſtaken for a Fracture.

The *Muſculus Occipitalis* has its Origin at the *Sutura Lambdoides*, and covers the whole *Occiput*: It draws the Skin of the Head from before backwards.

The

The *Sutura Lambdoides* is formed by the Conjunction of the *Occiput*, with the Two *Ossa Parietalia* on the Superior and Lateral Part, and on the Posterior Part with the *Ossa Temporum* below.

In the Concave Part of the *Occiput* there is a large Cross, which divides the whole Bone almost into Four equal Parts. Unto this whole Cross the *Dura Mater* is most closely united. All along the Superior Branch of this Cross is fastened the Inferior Part of the Longitudinal *Sinus*.

At the Right Arm of the Cross there is a long Furrow, into which is fix'd the Right Lateral *Sinus*.

At the Left Arm of the Cross there is a long Furrow or Gutter, into which is plac'd the Left Lateral *Sinus*.

In the middle of the Cross there is a large Prominency: At this Place the Longitudinal *Sinus* becomes bifid, and forms the Right and Left Lateral *Sinus*.

Each of the Lateral *Sinus's* begins at the large Protuberancy in the middle of the Cross.

The Right Longitudinal *Sinus* begins at the large Prominency that is in the middle of the Cross.

The False begins at the large Protuberancy which is in the middle of the Cross, and is fastened very firmly to it.

The Inferior *Sinus*, which is under the False, begins at the great Protuberancy which is plac'd in the middle of the Cross.

At the Inferior Branch of the Cross, which begins at the large Protuberancy in the middle of the Cross, and ends at the great *Foramen* of the *Occiput*, the *Duplicature* of the *Dura Mater*, which divides the *Cerebellum* into the Right and Left Part, is *fastened*.

Above each of the Branches of the Cross, there is a large Cavity, in which the posterior Lobes of the Brain are received.

Above the Two Branches that run athwart the Cross, there are Two large Cavities, which are the Receptacles of the Lobes of the *Cerebellum*.

In the great Furrow or Gutter which is in the *Elongation* of the *Occiput*, betwixt the great *Foramen* and the *Sella* of the *Os Sphænoides*, the *Medulla Oblongata* is lodged.

The Vertebral Arteries are plac'd all along the Furrow of the *Occiput*, and slide along under the Marrow to enter into the Skull.

Upon the Brim of the great *Foramen* of the *Occiput*, which gives Passage to the *Marrow*, there is on each Side an oval Hole in the *Apophyses Coronoides*, through which passes the Nerve of the Ninth Pair; which dispersés itself into the Tongue and its Muscles, into the *Salival Glands*, into the Muscles of the *Os Hyoides*, &c.

This Hole is sometimes double in the inside of the Skull, but they are united in One on the outside of it, as well as the Two Branches of the Nerves which do pass through these Two Holes.

Underneath the *Os Petrosum* there is a large Hole, form'd by the Conjunction of Two Chinks or Cuts, made by the *Os Occipitis*, near the great *Foramen*, thro' which the Marrow does descend, and by the inferior Part of the *Apophysis* of the *Os Petrosum*; from the middle of the superior Part of this Hole, there arises most commonly, a small osseous Point, unto which is fastened a Portion of the *Dura Mater*, which dividing the Hole into Two Parts, makes Two Holes of it; to wit, one Anterior and the other Posterior: Thro' the anterior Hole, the spinal Nerve, and that of the Eighth Pair, have their Egress; this Last is dispersed afterwards thro' the *Musculi Longi & Scaleni* of the Neck of the *Larynx*, thro' the Muscles of the *Os Hyoides*; thro' the *Cephalopharingæi*, the *Sphænopharingæi*, and *Stylopharingæi* of the *Oesophagus*, and its *Sphincter*; thro' the *Musculi Scaleni*, *Mastoidei*, &c. This Nerve enters into the Concavity of the Breast, where it imparts its Branches to the Lungs, and to several other Parts of the Breast. It penetrates to the *Oesophagus*, the *Omentum*, &c. thro' the posterior Hole, form'd by the Conjunction of the *Os Occipitis*, and of the Point of the *Apophysis*, unto which the *Dura Mater* is fastened, the lateral *Sinus* which exonerate themselves into the Internal *Jugulars*, have their Egress.

There is a Furrow in this Bone under the *Os Petrosum*, in which the bottom of the *Sack* of the Internal *Jugular* has its Progress.

At

At the posterior Part of the *Foramen*, thro' which the lateral *Sinus's* have their Egress, there is to be observ'd a Hole, the Entrance whereof is behind the *Condyli*, which are situated at the Sides of the *Foramen* of the *Occiput*, thro' which passes a Vessel which opens into the *Vertebral Sinus*. Sometimes this Hole is observable only on one Side, and sometimes there is none at all; and then the Blood that is contained in the lateral *Sinus's*, empties it self into the Internal *Jugulars*.

The *Occiput* is articulated by its superior and lateral Part with the *Parietalia*; by its inferior and posterior, with the *Ossa Temporum*; by its inferior and anterior, with the *Os Petrosum*, and the *Cuneiforme*.

The *Occiput* differs so very much in the *Fœtus*, that it is very difficult to say any Thing of this Bone with any certainty.

In a *Fœtus* of Nine Months, it consists always of Four Pieces, the biggest of which forms all the posterior Part of the Head: The Three smaller do form the Hole thro' which the *Marrow* does descend; to wit, Two on the Sides, and the *Apophysis* call'd the *Elongation* of the *Occiput*.

In the *Fœtus's* before they come to their Maturity for the Birth, the biggest Part of the *Occiput* is separated from all the other Bones, by Membranes, which turn osseous by degrees.

Of the OSSA TEMPORUM.

The *Ossa Temporum*, or Bones of the Temples, do form the inferior, lateral, and middle Part of the Skull, under the *Parietalia*.

They are the smallest of all the proper Bones of the Skull; they are distinguish'd into Two Parts, which are divided in young Children, to wit, into the superior Part, which grows lesser and lesser, and is call'd the *Os Squamosum*; and into the inferior Part, which is call'd the *Petrosum*, because it is very hard and rough. This Part contains the small Bones of the Ears, and all the other Organs of Hearing.

The squamous or scaly Part of the Temples is a large circular Bone, flat on the exterior Part, and on the Inside growing thin or slopewise, like a *Glacis*, for its better Connexion and Application with the *Parietalia*.

Unto the whole exterior Part of the *Os Squamosum* is fastened a large Muscle, call'd the *Temporal* or the *Crotaphites*: It is fastned also to the lower Part of the *Parietale*, above the *Sutura Squamosa*, and in the Cavity of the Temples; it proceeds under the *Zygoma*, unto which it is fastened, and embraces the *Apophysis Coronides* of the inferior Jaw-bone.

The *Musculus Attollens* of the Ear consists of some carneous Fibres, couched from above downwards upon the *Pericranium*, and going on in a strait Line are fastened to the posterior Part of the Ear.

The *Apophysis Mastoides* is a large Protuberancy, situated at the inferior and posterior Part of the Bone of the Temples: Unto the superior and anterior Part of the *Apophysis Mastoides* is fastened a small Muscle, compoſed of Five or Six carneous Fibres, which descend obliquely, and terminate in the middle of the *Concha* of the Ear.

Into the posterior Part of the *Apophysis Mastoides* is inserted the *Musculus Mastoidæus*, which has its Origin at the superior and the exterior Part of the *Sternum*, and at the middle of the *Clavicula* for the Flexion of the Head.

At the *Basis* of the *Apophysis Mastoides* on the inside, and behind the *Apophysis Styloides*, there is a Furrow or Gutter, which beginning at a small Hole which is situated betwixt the *Apophysis Mastoides* and the *Styloides*, ends at the posterior Part of the Osseous *Mammilla*. Thro' this Furrow does pass one of the Bellies of the *Digastricus*, which has its Insertion at the interior Part of the *Symphysis* of the Chin, at its Inequalities, to pull the inferior Jaw-bone downwards. Behind the *Apophysis Mastoides*, to wit, at its Root there is a Hole on each Side, thro' which does pass a large Vein, which carries back part of the Blood that has been distributed into the Integuments and Muscles, which cover some of the hindmost Part of the Head. This Vein opens in the lateral *Sinus's*, in that Part where they begin again to wind themselves. Sometimes this Hole is observable only on one Side; and sometimes it is not extant, and then the Blood that is contain'd within these Vessels, empties it self into the external *Jugulars*, with

with which the Branches of this Vein have a Communication.

Juſt by the *Apophyſis Maſtoides*, there is a long pointed *Apophyſis*, call'd *Styloides*. At its Extremity there is faſten'd a Ligament, which goes directly to the Extremities of the *Cornua* of the *Os Hyoides*.

At the Root of the *Apophyſis Styloides*, the *Muſculus Styloceratohyoidæus* has its Origination, which is inſerved into the inferior Part of the *Horn* of the *Os Hyoides*, which it draws upwards.

On the Inſide of the *Apophyſis Styloides*, the *Stylopharingæus* has its Riſe, and its Inſertion at the *Pharynx*, which it draws upwards to the Sides, for its Dilatation.

At the exterior Part of the *Apophyſis Styloides* ariſes the *Styloglosſus*, which is inſerted into the Sides of the Tongue, which it draws upwards.

At the inferior and middle Part of the *Oſſa Temporum*, there is a long *Apophyſis*, call'd the *Zygomaticus*.

The Extremity of the *Zygomatick* Proceſs is articulated by a Suture with the poſterior *Apophyſis* of the *Os Mali*, both which together form a Kind of an Arch, under which paſſes the ſtrong Tendon of the Muſcle call'd the *Temporalis*.

In the Middle of the inferior Part of the *Zygomatick Apophyſis*, there is a large Chink, unto which the *Muſculus Zygomaticus* is faſten'd, which has its Inſertion at the Angle of the Lips, to pull them aſide.

At the inferior Part of the *Os Temporum*, to wit, betwixt the Root of the *Proceſſus Zygomaticus* and *Styloides*, there is an oval *Sinus*, inveſted with a Cartilage, into which the Head of the lower Jaw-Bone is articulated.

The whole Circumference of this *oval Sinus* is encircled by a membranous Ligament, which alſo embraces the Neck of the Head of the inferior Mandible; ſo that the whole Articulation is ſurrounded by this Ligament.

Betwixt the Root of the *Apophyſis Maſtoides* and the *Zygomaticus*, there is a large oval *Foramen*, or Hole, call'd the *Conduit of the Ear*, which gathers the Air to form the Sound.

All round the Brim of this Conduit of the Ear, there are ſome Inequalities, eſpecially on that Side towards the Cavity, into which the Cartilage of the exterior Ear is moſt cloſely united, being covered with a Skin, under which is a little Fat, and a nervous Integument, which immediately ſurrounds the Cartilage of the external Ear. Its Parts are:

The rugged or convex Circle, or ſuperior Pleat, which ſurrounds the upper Part of the Ear.

The Semicircle, which is ſituated under the convex Cartilage.

The *Concha*, being that Cavity which is comprehended within the Semicircle, and reaches to the *Alveolus*, which is the *Foramen* ſituated in the Middle of the Ear.

The Lobe or Fibre of the Ear, is that ſmall Piece of Fleſh at the lower End of the Ear, unto which we faſten the Ear-Pendants.

The *Pinna* is the whole external Ear, excepting the Lobe.

The *Helix* is the whole exterior Surface of the Ear.

The *Antihelix* is the interior Part of the *Pinna*, which is next unto the Head.

Behind and upon the Brim of the Hole of the Ear, there is a Pit, unto which is faſten'd a ſtrong Ligament, which ties the Cartilage of the Ear to the *Os Temporum*.

There is a Conduit which begins at the Extremity of the *Os Petroſum*, and continues its Courſe within the Bone to the Root of the *Apophyſis Styloides*. Through this Conduit does paſs the internal *Carotides*, which enters the Skull towards the *Optick Foramen*, on the Side of the *Sella* of the *Os Sphænoides*.

The *oſſeous Circle* of the Ear is faſten'd to the Bottom of the Conduit of the Ear.

There is an oblique Sinuoſity ſituated at the ſuperior Part of the oſſeous Ring or Circle, in which lies concealed Part of the *Muſculus Externus*.

The Chink of the oſſeous Circle of the Ear, is a ſmall Cleft, hollowed within round the whole ſmall oſſeous Circle. Into this Chink is faſten'd the Membrane of the *Tympanum*, which divides the external Ear from the internal.

There is a Vacancy in the ſuperior Part of the oſſeous Circle, for there wants about the Breadth of One or Two Lines to make

ſit compleat. 'Tis at this vacant Space where the Membrane of the Drum is only applied to it, leaving a Space and Paſſage for the Fumes which the Humours ſend forth through the Mouth into the Ears by Means of a Conduit: Of which, we ſhall ſpeak anon.

The Barrel is a Cavity under the oſſeous Circle and the Membrane of the Drum, being hollowed out within the *Os Petroſum*, and contains the Four ſmall Bones of Hearing.

This Cavity is inveſted with a Membrane, which is covered with a great Number of ſmall Veſſels which are annexed to certain Aſperities. Moſt of theſe Veſſels are Branches of the *Carotides*, which diſperſe themſelves into the *Dura Mater*, and the reſt are Branches of thoſe Veſſels which are diſtributed into the Membranes that inveſt the Sinuoſities of the *Apophyſis Maſtoides*.

The Canal is a Conduit which opens into the anterior Part of the Barrel, and with its other Extremity into the Palate. Its Situation is before the oſſeous Conduit, which encloſes the internal *Carotides*. 'Tis through this Conduit that the Air enters into the Drum, or that it paſſes from the Drum to the Mouth, where it is puſh'd forward by the Force of the Air which the Membrane of the Drum receives from abroad; for the Drum being too full of Air, the Vibrations could not be performed, unleſs there were a free Paſſage for the Air to go out. 'Tis alſo through this Conduit that deaf People can underſtand ſomething of what is ſaid when they open the Mouth, and that the Smoak of Tabacco opens its Paſſage through the Ear.

There is a Conduit which reaches into the Cavity of the *Apophyſis Maſtoides*, into which the Air is puſh'd by the Vibrations which are made upon the Membrane of the Drum by the external Air; for if the Drum were too full of Air, the Vibrations could not be made. The Entrance of this Conduit is at the upper Part of the *Barrel*.

At the Extremity of the oſſeous Canal there are ſome Inequalities, unto which is faſten'd another Pipe, which is partly Cartilaginous, partly Membranous, which finiſhes the Conduit which reaches below the Palate of the Mouth.

At the upper Part of the *Barrel* there is a ſmall Cavity, in which are placed the Heads of the Hammer, and of the Anvil.

The *Feneſtra Ovalis* is ſituated at the Bottom of the Drum: And 'tis in this Opening that the Baſis of the Stirrop is faſten'd. This Hole opens into the Labyrinth, and makes the Entrance of the *Veſtibulum* into the ſuperior Part.

At the Bottom of this *Feneſtra Ovalis* there is a ſmall Jetting out, upon which the Baſis of the *Stirrop* does reſt.

The ſuperior Part of the Stirrop is call'd the Head, into which a Muſcle has its Inſertion.

There is a hollow oſſeous Pipe in the *Os Petroſum*, at the Bottom of the *Barrel*, into which is faſten'd the Muſcle of the Stirrop, which by contracting it ſelf, draws the Stirrop on one Side to give Paſſage to the Air.

At the Bottom of the Barrel there is a round Hole, through which the Air enters, and moves a ſmall Membrane, which is inſerted into the Middle of this Hole. This Hole gives Entrance into the inferior Part; of which, more hereafter.

There is a ſmall Trench in the Middle of the Conduit of the round Hole, into which is fix'd a Membrane like unto that of the Drum, which is ſhaken by the Vibrations of the Air.

The *Malleus*, or *Hammer*, is a longiſh Bone, thick and round at one End, and pointed at the other. The *Head* of the *Hammer* is a round *Apophyſis* at one of its Extremities. The *Handle* of the *Hammer* is a long *Apophyſis*, which terminates in a Point.

There is a Cavity and Two Prominencies at the Extremity of the *Head* of the *Hammer*, into which the *Head* of the *Incus*, or *Anvil* is articulated.

The *Handle*, or the long *Apophyſis* of the *Hammer*, is faſten'd lengthways to the Membrane of the Drum. The *Muſculus Internus* is inſerted at the poſterior Part of the *Handle* of the *Hammer*, under its Head, a little under the *Muſculus Externus*, and has its Origination at the Place where the bony Part of the Conduit does terminate.

There is a ſmall Riſing near the *Foramen Ovale*, upon which she Tendon of the *Muſ-*

culus Internus doth paſs, before it is inſerted into the *Handle* of the *Hammer*.

The ſmall *Apophyſis* of the *Hammer* is ſituated below the Head of the *Hammer*, unto which is faſten'd the Tendon of the *Muſculus Externus*, ſo call'd from its Situation upon the exterior Part of the Conduit, from whence it enters into the *Barrel*.

The *Incus* or *Anvil*, is a ſmall Bone reſembling unto an Anvil, the Head whereof is inchaſed into a Cavity at the ſuperior Part of the *Barrel*, and is articulated with the Head of the Hammer.

The Head of the *Anvil* has one *Prominency*, and Two Cavities, into which are received the Two Prominencies, and the Cavity of the Head of the *Hammer* by a *Ginglymus*.

The ſhort *Apophyſis* of the *Anvil* is placed at the Entrance of the Conduit, which reaches to the *Apophyſis Maſtoides*. There is a ſmall Cavity at the Entrance of the Conduit of the *Apophyſis Maſtoides*, in which the Extremity of the ſmall *Apophyſis* of the *Anvil* is conceal'd, and faſten'd by a Ligament.

The long *Apophyſis* of the *Anvil* is articulated with the Head of the Stirrop, be Means of a very ſmall Bone which lies betwixt them.

The *Stapes* or *Stirrop*, ſo call'd from its Reſemblance to a Stirrop, is, with its *Baſis*, inchaſed into the *Feneſtra Ovalis* we have ſpoken of before.

There is a ſmall Cavity at the Head of the Stirrop, into which is received the Convexity of a very ſmall Bone, wherewith the *Apophyſis* of the *Anvil* is articulated.

There is a ſmall Opening in the Stirrop that has a Furrow, in which is faſten'd a Membrane, which is interſperſed with many Veſſels.

The *Baſis* of the *Stirrop* is altogether like the Bottom of a common Stirrop upon which we reſt our Feet: This Baſis is placed upon the *Feneſtra Ovalis*.

The fourth ſmall Bone is ſituated betwixt the Head of the Stirrop, and the long *Apophyſis* of the *Anvil*. It is Convex on that Side where it is faſten'd with the Head of the Stirrop; and Concave on that Part where it receives the long *Apophyſis* of the *Anvil*. 'Tis call'd the *Orbicular Bone*.

Theſe before-mentioned Four ſmall Bones have no Cartilages where they are articulated, but Ligaments, which tie them together.

The *Hammer*, the *Anvil*, and the fourth ſmall Bone, have no Marrow, and are very ſolid; but the Stirrop is porous and light. Theſe ſmall Bones are provided alſo with ſmall Holes, for the Paſſage of certain Veſſels that carry their Nouriſhment to them.

The *Veſtibulum* or *Porch*, is a Cavity almoſt round, ſituated behind the *Feneſtra Ovalis*, being on its Inſide covered with a Membrane, which is interſperſed with Veſſels.

The *Labyrinth* is compoſed of the *Veſtibulum*, and of Three ſemicircular Conduits, which open into the *Veſtibulum* or *Porch* by Five Apertures, and of the *Cochlea*.

The ſuperior ſemicircular Conduit embraces the ſuperior Part of the Arch of the *Porch*: It runs from before backwards out of the *Veſtibulum*, and with its other Extremity is conjoin'd with the inferior Conduit.

The inferior ſemicircular Canal or Conduit ariſes from the inferior Part of the *Porch*, and unites with the ſuperior ſemicircular Conduit, ſurrounding the inferior Part of the Porch: Theſe Two Conduits open in the *Veſtibulum* by one common Aperture.

The middle ſemicircular Canal or Conduit is ſituated betwixt the Two others; it makes no more than a Semicircle, whereas the others exceed that Compaſs.

Theſe Three Conduits open in the Porch by Five Apertures, becauſe the Inferior and Superior have one common Orifice.

The common Entrance of the ſuperior and inferior Conduit is the biggeſt, and placed in the Middle of the Porch: The Lowermoſt Aperture in the *Porch*, is the Entrance of the Inferior Conduit.

The Hole which is above the inferior Conduit, is the Entrance of the Middle Conduit: The Auditory Nerve ſlides into theſe Three Conduits.

The *Cochlea* is below the Porch, ſtretching towards the Point or Extremity of the *Os Petroſum*: It conſiſts of a ſemicircular ſpiral Conduit, and of a Lamel which turns ſpiral.

The *Demi-oval* Conduit is hollow in that Part of the *Os Petroſum*, which covers the *Spiral Lamel* in the Nature of an Arch; it terminates in the *Barrel* like a ſmall Beak. This Beak, or Bill, makes the Partition betwixt the *Feneſtra ovalis & rotunda*: This Conduit riſes in a Spiral Line. The *Spiral Lamel* is a ſlender Membrane, which riſes like a Spiral which turns round a Pivot like a Pair of Stairs, one above the other.

There is an Aperture at the inferior Part of the *Os Petroſum*, under the Hole that gives Entrance to the Auditory Nerve, thro' which paſſes an Artery and a Vein, which are Branches of the Internal *Carotides*, and the *Jugular*. This Conduit opens it ſelf in the interior Part of the *Cochlea*, near the *Feneſtra Rotunda*.

Theſe Veſſels are diſperſed through the Spiral Lamel, and through the Membrane that inveſts the Inſide of the Spiral Canal: The Artery ſends forth a Branch to the *Porch*, and enters the ſemicircular Conduits.

The *Foramen* that gives Paſſage to the Auditory Nerve, is ſituated in the Middle of the poſterior Part of the *Os Petroſum*, on the Inſide of the Skull: This Hole forms a kind of a Bottom of a Sack, which is anſwerable to the Baſis of the *Cochlea*, and to the *Arch* of the Porch.

There is a *Foramen* at the ſuperior Part at the Bottom of the Auditory *Foramen*, through which the hard Part of the Auditory Nerve does paſs; which has its Egreſs out of a ſmall Hole that is ſituated betwixt the *Apophyſis Maſtoides* and *Styloides*.

There are certain ſmall Holes at the Bottom of the Hole of the Auditory Nerve, through which the ſoft Part of the Auditory Nerve has its Paſſage, and is divided into Three Branches at the Bottom of the Sack, being afterwards diſperſed into divers Parts of the *Labyrinth*.

There is a long Gutter ſituated all along the ſuperior Part of the *Os Petroſum*, on that Side which it next to the Brain: All along within this Gutter, a *Sinus* of the *Dura Mater* is conſpicuous, which reaches to the *Sella* of the *Os Sphænoides*.

All along the inferior Part of the *Os Petroſum*, there is a *Sinus* of the *Dura Mater*, which has a Communication with the other *Sinus*, within the Gutter, towards the *Sella*; and theſe Two *Sinus's* have alſo a Communication with thoſe of the other *Apophyſis*, towards the poſterior *Apophyſis Clinoides*.

The Bones of the Temples in the *Fœtus* is compoſed of Two Bones; to wit, the ſcaly Part, which is ſeparated from the rocky or ſtony Part; it has no *Apophyſes Mamillares*, nor *Styloides* that are bony: The Four ſmall Bones of Hearing, which are within the Ear, are as large as in Adult Perſons. The circular ſmall Bone, unto which the Membrane of the *Tympanum* is faſten'd, may be ſeparated from the *Os Petroſum*: The Temple-Bone is articulated on its ſuperior Part, with the inferior of the *Os Parietale*, on its lateral and anterior Part, with the ſuperior *Apophyſis* of the *Os Cuneiforme*, and with the Proceſs call'd the *Elongation* of the *Occiput*; at its poſterior Part, with the inferior and poſterior Part of the *Os Occipitis*; and at its long *Apophyſis*, with that of the *Os Mali*.

The *Sutura Squammoſa*, is form'd by the Connexion of the *Os Squammoſum*, with the *Os Parietale*, the *Occiput*, and the *Cuneiforme*.

Of the OS SPHÆNOIDES.

The *Os Sphænoides*, or *Cuneiforme*, occupies the inferior and interior Part of the Skull, which it cloſes up, being placed like a Wedge betwixt the other Bones; it is called alſo the *Baſilare*, becauſe it is the *Baſis* of the Skull.

The Subſtance of this Bone is very unequal, thin in ſome Places, and hard and thick in others, and is of an irregular Figure.

Under the *Sella* of the *Sphænoides*, this Bone is divided into Two oſſeous Lamels; to wit, the ſuperior and the inferior; betwixt which there is a Cavity divided in Two by an oſſeous *Lamina*, which ſtretches from above downwards: This is called the *Sinus* of the *Os Sphænoides*, which is not to be found in all Perſons; and when it is wanting, the Bone is very ſpongious and light.

In young People, this Bone is ſeparated into Four Parts: The *Firſt*, is about an Inch diſtant from the Crown of the *Occi-*

Put: The *Second*, is that which is called the *Sella Equina*, or the *Sadle*, and the Elongations deſign'd for the Optick Nerves: The *Third* and *Fourth* are more raiſed, and call'd the *Temporal Apophyſes* of the *Os Sphænoides*: But ſome Authors will allow of no more than Three; to wit, the *Firſt*, which makes the *Baſis*; the *Second*, the *Sadle*; and the *Third*, the *Apophyſes Pterigoides*. But in Adult Perſons, the *Sphænoides* is only one ſingle Bone, which the Ancients uſed to call the *Colatorium*; becauſe they were of Opinion, That the *Pituita* was percolated by theſe Holes into the Mouth.

In the Middle of the *Os Cuneiforme*, betwixt the Two *Apophyſes Pterigoides*, there is a ſmall *Apophyſis* pointed at the End, and broad at the *Baſis*; unto this *Apophyſis* the Cavity of the *Vomer* is inchaſed.

The *Muſculus Attollens Proprius* of the Eye-lids, is faſten'd unto the Superior Part of the *Foramen Opticum*.

The *Muſculus Superbus* is fixed to the ſuperior Part of the *Foramen Opticum*.

The *Humilis* is faſten'd unto the lower and middle Part, in the *Foramen Opticum*.

The *Major Obliquus* is placed in the *Foramen Opticum*, a little on one Side of the *Attollens* of the Eye-lids. It riſes along the Bone, which forms the ſuperior Part of the *Orbit*, and paſſes through the little cartilaginous Pulley which is faſten'd unto the ſuperior Part of the *Orbit*, in a ſmall Cavity at the Side of the Noſe.

At the Bottom and the upper Part of the external lateral Part of the *Orbit*, above the pointed Angle of the *Os Sphænoides*, there is a Hole, through which paſſes an Artery, being a Twig of a Branch of the internal *Carotides*, which touches upon the Eye, which is diſperſed almoſt through the whole *Dura Mater*, that covers the anterior Part of the Brain.

Towards the Middle of the *Os Sphænoides*, to wit, on each Side of the *Vomer*, there is a large *Apophyſis*, hollowed in the Middle of it, ſhaped like Two Wings, whence it is called the *Apophyſis Pterigoides*.

The exterior Part of the *Apophyſis Pterigoides*, is called the Exterior Wing; and the interior Side of it, is the Interior Wing.

The *Muſculus Pterigoidæus Internus*, has its Origination on the flat interior Side of the exterior Wing of the *Apophyſis Pterigoides*, and is inſerted on the interior flat Side of the Angle of the inferior *Maxilla*, which it ſhuts.

The *Pterigoidæus Externus* ariſes at the exterior Side of the exterior Wing of the *Apophyſis Pterigoides*, and has its Inſertion in that Space which is betwixt the *Condylus* and the *Corone* of the inferior *Maxilla*, which it draws aſide.

The *Pteriſtaphilinus Internus* has its Riſe at the ſmall *Styliform* Point, that is ſituated before the great *Apophyſis Styloides*: It aſcends along the Wing of the *Apophyſis Pterigoides* on its interior Side, and winds itſelf round a ſmall Hook that is at the Extremity of the interior Wing, like on a Pulley, and is inſerted into the Palate. At the Extremity of the inferior Wing of the *Apophyſis Pterigoides*, there is a ſmall Hook, round which the Tendon of the *Pteriſtaphilinus Internus* and *Externus* do turn or wind themſelves.

The *Pteriſtaphilinus Externus* ariſes from the Baſis of the interior Wing of the *Apophyſis Pterigoides*: It aſcends all along the Outſide, winds itſelf round the ſmall Hook that is at the Extremity of this Wing, and has its Inſertion at the Palate.

Betwixt the *Apophyſis Pterigoides* and the *Styloides*, there is another ſmall Proceſs, called the *Styliformis*: It is very ſharp-pointed, and the *Sphenopharingæus* is faſten'd to it, which has its Inſertion on the Side of the *Pharynx*, which it draws aſide for its Amplification.

In the Skull in the Middle of the *Os Sphænoides*, there is a Cavity, which reſembling unto a Horſe's Saddle, is called the *Sella Turcica*: Within this is fixed a large Gland, called the *Pituitary Gland*; over which is placed the Tunnel of the Brain.

In the Middle of the *Sella* of the *Os Sphænoides*, there are ſome ſmall Holes that are obſervable chiefly in young Bodies. Many of the Anatomiſts have been of Opinion, That the *Lympha*, which is contained in the *Pituitary Gland*, is diſcharged into the *Sinus* that are within the *Sella* of the *Os Sphænoides*, and that from thence it was carried into the Mouth; but moſt commonly theſe Holes diſappear in Adult Perſons; and in Children, are fill'd up with ſanguinous Veſſels which convey back the Blood from the Bones, that form the *Sinus's* of the *Sella* and

of

of the Membranes, wherewith theſe *Sinus's* are inveſted; ſo that 'tis not likely that the *Lympha* ſhould paſs through theſe Holes. There is a *Sinus* or Cavity within the Hollowneſs of the Two Tables of the Bones, which forms the *Sella* of the *Os Sphænoides*, into which ſome have believed, that the *Lympha* of the Pituitary Gland did empty itſelf, in order to its being convey'd from thence to the Mouth.

There is moſt frequently obſervable, an Oſſeous Lamel, which ſtretches from above downwards, and divides into two the great *Sinus*, which is under the *Sella* of the *Os Sphænoides*.

'Tis believed, That the *Dura Mater* does not adhere to the Surface of the Bottom of the *Sella* of the *Os Sphænoides*.

On each Side of the *Sella* of the *Os Sphænoides*, at its anterior Part, there is a long ſharp-pointed *Apophyſis*, which is called the Anterior *Apophyſis Clinoides* of the *Sella* of the *Os Sphænoides*.

On each Side of the poſterior Part of the *Sella* of the *Os Sphænoides*, there are Two *Apophyſes*, call'd the Poſterior *Clinoides*.

At the Root of each anterior *Apophyſis Clinoides*, there is an exact round Hole, of the Bigneſs of a ſmall Writing Pen, which gives Paſſage to the Second Pair of Nerves, called the *Optick*, which enter into the Eye-Apple, and do form the *Retina*. Through the inferior Part of this Hole, paſſes a large Branch of the *Arteria Carotides* into the *Orbit*.

Juſt under the anterior *Apophyſes Clinoides*, is a long Trench form'd by very ſharp-edged Bones, reaching from the anterior Side of the *Sella* of the *Os Sphænoides* till towards the Temples, where it terminates in a very large pointed Angle, under the *Foramen Opticum*. Through this irregular Furrow, the whole Third Pair of Nerves, called the *Motores* of the Eyes, do paſs; the whole Fourth Pair, called the *Pathetick*; the whole Sixth Pair, and the ſuperior Twig of the anterior Branch of the Fifth Pair, called the *Optick* Branch.

Juſt above where this great irregular Furrow had its Beginning, and at the Side of the *Sella* of the *Os Sphænoides*, there is a ſmall round Hole, which does not pierce the Skull directly from above downwards, but has its Aperture behind the *Orbit*, betwixt the *Apophyſis Pterigoides*, and the great Bone of the ſuperior *Maxilla*: Through this Hole paſſes the inferior Twig of the anterior Branch of the Fifth Pair.

Immediately under this Conduit, on the Side of the *Sella* of the *Os Sphænoides*, at a few Lines Diſtance from the Extremity of the *Os Petroſum*, there is on each Side a pretty large oval Hole, which penetrates thro' the poſterior Extremity of the *Os Sphænoides*, through which the poſterior Branch of the Fifth Pair paſſes.

At a Line's Diſtance from the poſterior Point of this beforeſaid oval Hole, there is a very ſmall Hole, the Diameter of which does not exceed the Breadth of a Line, thro' which a Branch of the external *Carotide* Artery does paſs; which entring into the Skull, is faſten'd to the *Dura Mater*, where it is divaricated into many Branches, which diſperſe themſelves through that Part of the *Dura Mater* which covers the Sides and upper Part of the Brain.

At half a Line's Diſtance above the ſharp-pointed Angle of the great irregular Furrow, there is a ſmall Hole, through which does paſs a Twig of a Branch of the internal *Carotides*, which touches upon the Eye, and diſperſes itſelf almoſt through that whole Part of the *Dura Mater* which covers the fore Part of the Brain.

The *Os Sphænoides* is ſtill cartilaginous in the Second Month; but its Two Wings become oſſeous in the Third: In the Fourth Month, it does conſiſt moſt commonly of Eight Bones: In the Fifth Month, all its ſmall Bones begin to be cemented together: And in the Ninth Month, they make but one Bone, though they appear as yet to be ſeparated by ſome Lines or Streaks.

The *Os Sphænoides* is articulated at its poſterior and lateral Part with the Temple-Bone; at its inferior and poſterior Part, with the inferior Part of the Bone of the Temples, and with the Elongation of the *Occiput*; at its interior Part, with the *Os Coronale*, the *Ethmoides*, the great Bone of the Mandible, the Two Bones of the Palate, and the *Os Mali*; and by its great *Apophyſis Temporalis*, with the *Parietaria*: To be ſhort, it touches upon all the Bones of the Skull, excepting the *Os Unguis*, and the *Os Naſi*.

Of

Of the OS ETHMOIDES.

The *Os Ethmoides*, or *Cribroſum*, is ſo called, becauſe it is perforated with many ſmall Holes like a Sive: It is inchaſed within a large Notch, which is ſituated in the interior, inferior, and middle Part of the *Os Frontis*, and deſcends into the Noſe, where it occupies almoſt the whole Cavity. The *Os Cribroſum* makes the upper Part of the *Ethmoides*.

The *Os Cribroſum* is perforated with many ſmall Holes, through which paſs the Firſt Pair of Nerves, which form the Organs of Smelling. This Pair being diſperſed into many Threads, enter into the Noſe, and afterwards diſperſe themſelves in the interior Tunick. 'Tis alſo through thoſe ſmall Holes that the *Pituita* was formerly believed to paſs from the Brain into the Noſe, but with very little Probability, ſeeing this Sive-like Bone is covered with the *Dura Mater*, which is very porous in this Place, and perforated with many ſmall Holes through which the Optick Nerves paſs, which fill up all the Holes of the *Os Cribroſum*.

The *Criſta Galli*, is a flat *Apophyſis* like a Comb of a Cock, being ſituated in the Middle of the *Os Cribroſum*, which it divides as it were in Two Parts. The *Dura Mater* is faſten'd very cloſe to this *Apophyſis*.

The *Os Planum* is a bony Lamel, very ſmooth and ſlender, united on each Side of the *Os Ethmoides*: This Bone forms the lateral, internal, and middle Part of the *Orbit* of the Eye.

There is a ſmall Hole in this Bone, call'd the interior *Orbital*, through which a Branch of the Fifth Pair of Nerves does paſs: Sometimes this Hole is in the inferior Part of the *Os Frontis*, which makes Part of the *Orbit*.

The ſpongious Lamels of the *Os Ethmoides* are turned like a Horn, and ſituated in the Cavity of the Noſe, which they almoſt fill up; and under the *Os Cribroſum*. Theſe Lamels are inveſted with a Membrane, which is called the interior Membrane of the Noſe; and upon this Membrane are couched the Ramifications of the Olfactory Nerves: The more theſe ſpongious Lamels are in Number, the more quick we are in Smelling.

Betwixt the ſpongious *Laminæ*, which occupy almoſt all the Cavity of the Noſe, there is to be obſerved a large oſſeous *Lamel*, which is both flat and thin, and faſten'd at its ſuperior Part to the Middle of the *Os Cribroſum*. 'Tis this *Lamel*, which in Conjunction with another call'd the *Vomer*, and a Cartilage, form the Noſe and the Partition that divides it into Two Cavities of an equal Bigneſs: 'Tis alſo upon this *Lamel* that the Two Bones of the Noſe do reſt.

The oſſeous Partition which ſeparates the Noſe into Two equal Cavities, has on its anterior Part a long unequal and rugged Notch, all along unto which is fixed a Cartilage, which forms one half of the Noſe; to wit, from the Extremity of the Bones of the Noſe, to the Lip.

In the anterior and inferior Part of the Cavity of the Noſe, there are Two ſmall ſpongious Bones, bent like a Horn; they are not faſten'd to the *Os Ethmoides*, but within a ſmall Foſs or *Sinus* of the great Bone of the Mandible which forms the Noſe, in Conjunction with the Two Bones of the Noſe. There is one of theſe *Horns* placed on each Side of the Noſe: They have the ſame Uſe as the ſpongious Bones of the Noſe; of which we have ſpoken before.

The whole *Os Ethmoides* is cartilaginous in a *Fœtus*, except in the *Os Planum*, which at Six Months End begins to turn oſſeous. The other Parts of the *Os Ethmoides* continue to be cartilaginous for a long Time after the Birth.

The whole *Os Ethmoides* which is compoſed of the *Os Cribroſum*, the Two *Oſſa Plana* of the ſpongious Lamels of the Noſe, and of the great Partition that divides the Noſe into Two equal Cavities, is articulated at the *Os Cribroſum*, within a large Notch ſituated at the interior, inferior, and middle Part of the *Os Frontis*: At the *Os Planum*, with the inferior Part of the *Os Frontis*, that which forms the ſuperior Part of the *Orbit* of the Eye; as alſo by the ſame *Os Planum*, with the lateral Part of the *Os Unguis*, that which advances furtheſt within the *Orbit*: And again, by the ſame *Os Planum*, with that Part of the great Bone of the Mandible, which forms the inferior

Part

Part of the Orbit on the Side of the great Angle By the *Os Spongioſum* it is articulated with the ſuperior Parts of the Two large Bones of the *Maxilla*, which do form the lateral Part of the Cavity of the Noſe.

Of the VOMER, *or the* PLOUGH-SHARE.

The *Vomer* is a long *Lamina* placed in the inferior and poſterior Part of the Cavity of the Noſe, which in that Part it divides into Two equal Cavities.

In the poſterior and inferior Part of the *Vomer*, there is a long and deep Furrow, in which a flat and pointed *Apophyſis* is articulated, which is ſituated in the Middle of the *Os Cuneiforme*, betwixt the Two *Apophyſes Pterigoides*.

All along the ſuperior Part of the *Vomer* there is a deep Chink, form'd by Two very thin oſſeous Lamels, in which the great *Lamina* of the *Os Ethmoides*, which forms the main Partition of the Noſe, is fixed by its inferior and poſterior Part. This *Lamina*, together with the *Vomer* and a Cartilage, make the whole Partition of the Noſe.

The whole Length of the inferior Part of the *Vomer* conſiſts of a thin and ſharp-edged *Lamina*. This Part of the *Vomer* is articulated at its whole Length with a long Cleft or Cavity, ſituated upon the Arch of the Palate, which on the Inſide makes the *Baſis* of the Noſe.

This Cavity is form'd by the Conjunction of the Two great Bones of the Upper-Jaw, and of the Two ſmall Bones of the Palate; all which together make the Vault or Arch of the Palate. This Cleft begins in the Noſe, and terminates in the poſterior Part, betwixt the Two *Apophyſes Pterigoides*. The *Vomer* begins to oſſify in the Fourth Month.

The *Vomer* is articulated on its poſterior Part with the Middle of the *Os Sphænoides*, and at its inferior Part with the *Lamina* of the *Os Ethmoides*, with the Two ſmall Bones of the Palate, and with the Two great Bones of the Mandible.

Of the Bones of the NOSE.

The Two Bones of the Noſe are ſmall Four-ſquare Bones, which form the ſuperior Part of the Vault of the Noſe.

The longitudinal Suture of the Bones of the Noſe, is made by the Conjunction of theſe Two Bones. It reaches from above downwards, from the *Os Frontis* to the Extremities of theſe Bones.

Upon each of the Bones of the Noſe, juſt by the longitudinal Suture, about the Middle, there is a ſmall round Hole, which affords Paſſage to the Blood-Veſſels.

At the Root of the Noſe there is a ſmall Suture, formed by the Conjunction of the Two Bones of the Noſe with the lower and middle Part of the *Os Frontis*, which may be call'd the tranſverſal Suture of the Noſe.

All along upon the longitudinal Suture of the Noſe, is plac'd a Production or Appendage of the *Muſculus Frontalis*, which makes a ſmall Triangle *Iſoceles*; the Baſe or largeſt Place of which is ſituated upon the tranſverſe Suture of the Noſe, and its Point terminates at the inferior Part of the Noſe. But this Part of the Muſcle is conſpicuous only in thoſe that have large Noſes.

At the ſuperior Part of the Bone of the Noſe, where it is articulated with the *Os Frontis*, there is a ſmall Point on that Side which looks to the great Angle of the Eye. Unto this Point is annexed the *Muſculus Attollens Naſi*, which deſcends in the Form of a Triangle to the lower Extremity of the Bone of the Noſe, and covers the whole flat Part of it, excepting a very ſlender Portion, which ſtretches all along the longitudinal Suture of the Noſe, upon which the Appendage of the *Muſculus Frontalis* reſts. This Muſcle has its Inſertion into the *Wings* of the Noſe, which it draws upwards.

The Spine or Ridge of the Noſe is the ſuperior and longitudinal Part, which begins at the *Os Frontis*, and reaches to the Cartilage call'd the *Acromion*.

The *Acromion* is a Cartilage which begins at the Extremities of the Bones of the Noſe, and ends at the Tip of the Noſe.

At the Extremity of the Bone of the Noſe, where the Cartilage *Acromion* has its Connexion, which forms the lowermoſt Half of the Bone of the Noſe, is faſten'd a ſmall Muſcle, call'd the *Interior Cloſer of the Wings of the Noſe*, which lies concealed on the Inſide under the Tunick of the Noſe.

At the Extremity of the Spine of the Bones of the Noſe there are certain Pits, unto which is faſten'd the Cartilage call'd the *Acromion*, which forms the inferior Half of the Noſe.

On the interior Part, and all along the longitudinal Suture of the Noſe, there is a Spine or Prominency, which does reſt upon the oſſeous and cartilaginous Partition of the Noſe.

The Bones of the Noſe are oſſeous in the *Fœtus* when come to its Maturity. In the Third Month, the ſuperior Part of the Noſe is already oſſify'd, but the inferior Part is ſtill membranous.

The Bones of the Noſe are on the ſuperior Part articulated with the inferior and middle Part of the *Os Frontis*, where, by their Conjunction, there is formed a ſmall tranſverſe Suture. On their lateral Parts they are articulated at their whole Length with the ſuperior *Apophyſis* of the great Bone of the Mandible, which forms the inferior Sides of the Noſe; and they are articulated one with another by the Means of a ſmall longitudinal Suture, which reaches from the upper Part quite to the Extremity of the Noſe.

Of the Two OSSA-UNGUIS, *or* NAIL-BONES.

The *Oſſa-Unguis* are Two ſmall *Laminæ* of the Bigneſs of the Tip of a Finger, placed at the great Angle of the Eye. It is call'd the *Nail-Bone* from its Reſemblance, as alſo the *Lacrymal*, becauſe the Tears fall into the Noſe through this Bone.

All along the lateral Part of the *Os Unguis*, that which is neareſt to the Noſe, there is a Gutter, or Trench, into which is fixed the Lacrymal Sack, or the inferior *Lacrymal Gland*, which penetrates into the Noſe, and through which the Tears run into the Noſe by Two ſmall Holes, call'd the *Puncta Lacrymalia*, which are plac'd in the *Lacrymal Gland*.

This ſmall Bone does form a ſmall Part of the oſſeous Vault of the Noſe, and Part of the Orbit of the Eye, at the great Angle.

The *Os Unguis* does not appear in a *Fœtus* till about the Fourth Month after Conception.

It is articulated at its ſuperior Part with the *Os Frontis*; and its poſterior and lateral, partly with the *Os Planum*, partly with the great Bone of the ſuperior *Maxillæ*; and at its anterior Part with the ſuperior *Apophyſis* of the great Bone of the *Maxilla*, which does form Part of the Noſe.

Of the OS MALI, *or* ZYGOMA.

The Two *Oſſa Mali* form the middle and lateral Part of the Face, and that rotund Prominency call'd (by the *French*) *La Pomette*.

The ſuperior *Apophyſis* of the *Os Mali*, is a Point of the Length of an Inch's Breadth, which is articulated with the inferior and lateral *Apophyſis* of the *Os Frontis*, and forms the leſſer Angle of the Eye.

Sometimes there are Two ſmall Holes to be obſerved in the *Os Mali*, which give Paſſage to Two Branches of the Veins.

Upon the Brink of the Suture of the leſſer Angle of the Eye, which is formed by the Conjunction of the *Apophyſis* of the *Os Mali* and of the *Os Frontis*, are faſten'd the ſmall Cartilages which form the Edges of the Eye-lids within the Orbit of the Eyes.

The poſterior *Apophyſis* of the *Os Mali*, is articulated with a long *Apophyſis* of the Temple-Bone, both which form a Kind of an Arch, under which paſſes and is faſten'd the ſtrong Tendon of the *Muſculus Crotaphites*.

The anterior *Apophyſis* of the *Os Mali* is articulated with the ſuperior Part of the *Os Maxillæ*, both which together form the inferior Part of the Orbit of the Eye.

The inferior *Apophyſis* of the *Os Mali* is ſhort and round, and does form the lower round Part of the Cheek.

At the inferior Part of the *Os Mali*, juſt by a ſmall Suture made by the Conjunction of the *Os Mali*, and the lateral *Apophyſis* of the

the great Bone of the Upper-Jaw, there are ſome Inequalities, all within half an Inch's Breadth, into which is inſerted the *Muſculus Maſſeter*, which deſcends to the Angle of the inferior Mandible.

This Bone oſſifies in the Third Month after Conception.

In the Fourth Month it is not as yet conjoin'd with the *Os Frontis*, unleſs it be only by a Membrane.

The *Os Mali* is articulated with the *Os Frontis*, the Temple-Bone, and the ſuperior Jaw-Bone, as alſo with the *Os Cuneiforme*.

Of the Two great Bones of the Superior MAXILLA.

The Two *Oſſa Maxillaria*, or the Two great Bones of the ſuperior *Maxilla*, are ſituated at the inferior and middle Part of the Face.

At the ſuperior Part of the *Os Maxillare*, there is a ſtreight *Apophyſis* of an Inch in Length, which forms Part of the oſſeous Vault of the Noſe, and almoſt the whole great Angle of the Eye.

On the Side and the Middle of this *Apophyſis*, there is a ſemicircular Trench, which, in Conjunction with the ſemicircular Chink of the *Os Unguis*, do form a Hole, which on each Side penetrates into the Cavity of the Noſtrils. Through this Hole paſſes the Lacrymal Gland.

At the Extremity of the long ſuperior *Apophyſis* of the *Os Maxillare*, there are ſome ſmall Teeth, wherewith a ſmall Part of the inferior *Apophyſis* of the *Os Frontis* is inarticulated, which forms a ſlender Part of the great Angle of the Eye.

At the Root of the large *Apophyſis* of the *Os Maxillare*, which is articulated with the *Os Frontis*, there is a pretty large oval Hole, ſituated juſt under the Orbit. Thro' this *Foramen* does paſs a Branch of the *Optick* Nerve, which dividing it ſelf into many Twigs, theſe are diſperſed all over the Surface of the *Os Maxillare*, and enter into the Cavities of the upper Teeth, and thus furniſh a Twig to the Root of each of theſe Teeth. This Nerve is diſperſed alſo through divers Parts of the Face.

Above the Foſs of the *Os Maxillare*, underneath that Hole through which the foreſaid Optick Branch does paſs, there is a large Depth or Trench, in which the *Muſculus Inciſivus* has its Origination, and is inſerted at the upper Lip, near the *Dentes Inciſores*. It draws the Lip upwards.

Above the Cavities or *Alveoli* of the laſt *Dentes Molares*, on the Outſide, is placed the *Muſculus Buccinator*, both on the upper and lower Jaw, and has its Inſertion in the fleſhy Part of the Jaw, for the Conveniency of turning and chewing the Aliments in the Mouth.

Above the Roots of the *Dentes Inciſores* there is a ſmall Column or Proceſs, which is formed by the Conjunction of the Two Bones of the Jaw, and ſituated at the Entrance of the Cavity of the Noſe. Unto this Proceſs is faſten'd the ſmall fleſhy Column of the Noſe that ſeparates the Two Noſtrils.

Juſt above the Root of the *Dens Caninus*, at the Side of the great Cavity of the Noſe, is placed the *Muſculus Dilatans* of the Wings of the Noſe, into which it has its Inſertion.

Upon the Brink of the inferior Part of the Orbit, towards the great Angle of the Eye, there is a ſmall Suture, which is form'd by the Conjunction of the *Os Mali* and the great Bone of the *Maxilla*. 'Tis upon the very Edge of this Suture, juſt within the Orbit, that the *Muſculus Obliquus Minor* of the Eye has its Origin, and its Inſertion at the Eye-Apple, near the leſſer Angle. This Muſcle moves the Eye from the leſſer Angle to the great.

Where the Two Upper Jaw-Bones are conjoin'd, betwixt the Two *Dentes Inciſores*, a little within the Entrance or Beginning of the Palate, there is a *Foramen* or Hole, and ſometimes Two or Three, conjoin'd together, which from the Noſe penetrate into the Palate. Through this *Foramen*, which is call'd the *Inciſorium*, does paſs a ſmall Artery of the Palate into the Cavity of the Noſe, as alſo a Vein, which carries back the Blood from the Noſtrils into the Palate. Some Anatomiſts have been of Opinion, That the *Pituita*, or Snot, was convey'd through this Hole from the Noſe into the Palate.

In the lowermoſt Part of each Jaw-Bone, there are moſt commonly Eight ſmall Cavi-

ties, in each of which is fix'd a ſmall Bone, call'd a *Tooth*; to wit:

In the Two Firſt anterior Cavities are fix'd Two Teeth, call'd the *Inciſores*, or Cutters, which have but one ſingle Root.

In the Third Cavity is plac'd a Tooth call'd the *Caninus*, or the Dog-Tooth. This alſo has but one Root.

In the Five laſt Cavities, which are backwards towards the Bottom of the Mouth, are fix'd Five Teeth, call'd the *Molares*, or *Grinders*; among which, thoſe that are neareſt to the *Dog-Tooth*, have ſometimes no more than One Root; but the reſt which ſtand more backwards, have Two or Three; for I never have been able to meet with Four compleat Roots in One Tooth. 'Tis true, there are ſome very large Teeth, which ſeem to be provided by Nature with Four Roots; but theſe Roots are never exactly diſtinct one from the other.

Within the *Alveoli* of the *Dentes Molares*, there are Two or Three ſmaller Pits or Cavities, which receive the Roots of theſe Teeth.

Within the hollow Subſtance of each of the large Bones, there is a very large *Sinus*, inveſted within with a Membrane that is full of ſmall Glands, which by their excretory Pores or Ducts, ſend a conſtant Supply of *Lympha* into this great *Sinus*, which falls into the Noſe when we lie aſleep upon one Side.

This great *Sinus* is ſometimes divided into other ſmall Cavities or Cells, which are ſeparated from one another by very ſmall and thin oſſeous Partitions.

There is a large Aperture of an oval Figure, of about Seven or Eight Lines in Length, and about Three or Four in Breadth, at the ſuperior, lateral, and internal Part of this great *Sinus*, through which the *Lympha*, or Snivel, falls from this *Sinus* into the Cavity of the Noſe.

The inferior Part of the *Os Maxillare* does form a large flat Surface, which, in Conjunction with that of its Fellow, forms the *Baſis* of the Cavity of the Noſe, and the greateſt Part of the Arch of the Palate.

The Two *Oſſa Maxillaria* form by their Connexion a long Cleft in the Noſe, all along into which is inchas'd the ſharp-edged inferior and longitudinal Part of the *Vomer*, which does form one Part of the Partition of the Noſe.

In a *Fœtus* of Three Months, the great Bone of the ſuperior *Maxilla* is oſſeous.

The *Oſſa Maxillaria* are by their ſuperior *Apophyſes* articulated with the lower and middle Part of the *Os Frontis*, and with the *Os Unguis* on that Side where it has a hollow Chink. By their lateral *Apophyſes*, they are articulated with the ſuperior Part of the *Os Mali*, which does make Part of the inferior Orbit; and alſo with its inferior Part. At the Bottom of the Palate, they are articulated with the anterior Parts of the *Apophyſes Pterigoides*, and with the ſmall Bones of the Palate, and with one another, by a long Suture, which reaches from the *Foramen Inciſorium* to the ſmall Bones of the Palate.

Of the Bones of the PALATE.

At the Bottom of the Palate of the Mouth, there are plac'd Two ſmall and thin four-ſquare Bones, call'd the Bones of the Palate. They are much thinner on that Side where they are conjoin'd with the *Os Maxillare* than on the other, where they are join'd with the *Apophyſis Pterigoides*. Both theſe Bones reſt upon the *Vomer*.

On each Side of theſe ſmall Bones of the Palate; to wit, at the Root of the laſt *Dens Molaris*, there is a pretty large Hole, through which the *Nervus Guſtatorius* does paſs. At the Place where theſe Two ſmall Bones of the Palate are join'd together, there is a ſmall Prominency, unto which the Palate is faſten'd.

Theſe ſmall Bones are ſcarce perceivable in a *Fœtus* of Three Months; but in the Fourth Month they are compleat.

Theſe Two ſmall Bones are at their anterior Part articulated with the Two *Oſſa Maxillaria*, which do form the anterior Part of the Palate; and at their Sides with the *Oſſa Maxillaria*, at the Root of the laſt *Dens Molaris*. By their Conjunction, they make a Kind of a Cleft in the Cavity of the Noſe, into which the inferior Part of the *Vomer* is fix'd. At their poſterior lateral Part, they have Two large *Apophyſes*, or thin *Laminæ*, which are moſt conſpicuous in young Bodies. By theſe they are faſten'd at the whole Length of the lateral and inte-

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rior Part of the interior Wings of the *Apophyſes Pterigoides*, which extend even to the Middle of the *Os Cuneiforme*, near the ſmall Proceſs which is articulated in the Cavity of the *Vomer*.

It has been a general Opinion, That theſe Bones did conſiſt only of thoſe Two ſmall four-ſquare *Laminæ* which make up the Bottom of the Palate, becauſe theſe flat *Apophyſes*, or *Laminæ*, are very cloſely united with the *Apophyſes Pterigoides* in Perſons of a very advanced Age; but in young Bodies they are eaſily ſeparated.

Theſe ſmall Bones are very apt to contract a Caries in the Venereal Diſeaſe, becauſe they are very thin; and when they are fallen away, the Patient ſpeaks through the Noſe.

Of the LOWER MAXILLA, *or* JAW-BONE.

The inferior Jaw-Bone does form the whole lower Part of the Face. It is ſhort in Men, but very long in Brutes. It is convex, hard, and ſmooth on the Outſide, but concave and not ſo ſmooth on the Inner-ſide.

At the very poſterior Part of this Mandible, there is an *Apophyſis* call'd the *Condyloides*, which is articulated within a Cavity of the Temple-Bone.

Round the Neck of the *Condylus* is faſten'd an *Aponeurotick* Ligament, which is tied alſo round the Edge of the Cavity of the Temple-Bones, to ſtrengthen the Articulation of the Jaw-Bone.

Juſt by the *Apophyſis Condyloides* of the Jaw-Bone, there is a long-pointed *Apophyſis*, call'd the *Corona*, round which is faſten'd the ſtrong Tendon of the *Muſculus Crotaphytes*, which does ſhut the Jaw-Bone.

Betwixt the *Apophyſis Condyloides* and the *Coronoides*, ſituated at the ſuperior and poſterior Part of the *Maxilla*, there is a Space formed in the Nature of a broad Croſs, unto which is faſten'd the ſtrong Tendon of the *Muſculus Externus Pterigoidæus*.

At the poſterior and inferior Part, there is a round ſhort *Apophyſis*, ſituated underneath the Two great *Apophyſes Condyloides* and *Coronoides*, which is call'd the Angle of the *Maxilla*.

At the flat exterior Part of the Angle of the *Maxilla*, there is a ſuperficial Cavity, into which one of the Tendons of the *Maſſeter* is faſten'd.

To the *Baſis*, or inferior and exterior Part towards the Chin, is faſten'd in a large Space the *Triangularis*, which aſcends obliquely at the Conjunction of the Two Lips to the upper Lip, which it draws downwards.

In the middle and the lower Part of the Mandible, is fix'd the Second Tendon of the *Maſſeter*.

Above the Angle of the Mandible, in the interior and middle Part, there is a large Hole, which is the Entrance into a Cavity or Conduit, that reaches within the hollow Part of the Bone, all round the Jaw-Bone. Through this Hole, and through the whole Extent of this Channel, does paſs a Branch of the internal *Jugular*, a Branch of the Artery of the external *Carotides*, a Branch of the internal *Maxillary* Nerve, and Three Branches of the Fifth Pair of the Brain, which, in their Paſſage through this Channel, throw ſeveral of their ſmall Threads into each Tooth, which ſupply them with Nouriſhment and Senſation.

Upon the exterior Surface of the Jaw-Bone, at about an Inch's Diſtance from the *Symphyſis* of the Chin, there is an oval Hole, which gives Egreſs to the Branch of the external *Jugular*, to a Branch of the external *Carotide* Artery, to a Branch of the internal Maxillary Nerve, and to Three Branches of the Fifth Pair of the Brain, which after having paſſed through the Cavity within the hollow Part of the *Maxilla*, before they leave it, ſend forth many Twigs, which ſtretch along this Conduit to the *Dentes Inciſores*; but after they have made their Egreſs, are diſperſed through the fleſhy Parts.

At the Middle of the Chin, there is a Line which reaches from above downwards, which is call'd the *Symphyſis* of the *Chin*. This Line turns oſſeous by degrees, and ſo makes but One Bone out of Two.

At the interior and middle Part of the Chin, there are ſome Inequalities from the middle Part of the Chin to the lower Part. Unto theſe Inequalities, at the lowermoſt Part are faſten'd the Two *Muſculi Digaſtrici*; to wit, one on each Side. This is the

lowermoſt of the Muſcles that are fix'd to the Inequalities on the interior Part, at the *Symphyſis* of the Chin.

The *Genioidæus* is faſten'd alſo to the Inequalities that are on the interior Part of the Chin.

The *Genioglosſus* is fix'd to the Inequalities that are at the interior Part of the *Symphyſis* of the Chin, in the Middle; to wit, one on each Side. This is the uppermoſt Pair of the Muſcles that are placed on the interior Part, at the Aſperities of the *Symphyſis* of the Chin.

The *Geniohyoidæus* is fix'd to the Inequalities, at the interior Part of the Chin.

The *Genioglosſus* is faſten'd to *Aſperities* that are on the Inſide of the *Symphyſis* of the Chin in the Middle, *viz.* one on each Side.

The *Mylohyoidæus* is fix'd within a large Space within the *Baſis* of the *Inferior Maxilla*, and approaches on each Side towards the great Teeth, and upon the ſuperior middle Part of the *Baſis* of the *Os Hyoides*, and runs athwart it from one Side to the other

On the interior and lateral Part, above the Angle of the Mandible, and underneath the large *Apophyſes*, there is a Cleft or Furrow, in which the ſtrong Tendon of the *Pterigoidæus Internus* is faſten'd.

All the inferior Part of the Jaw-Bone is covered with a large Membrane, which is the *Aponeuroſis* of the large Muſcle that draws the inferior Mandible downwards.

On each Side of the *Symphyſis* of the Chin on the exterior Part, there are Two ſmall Superficial Pits and Inequalities; in each of which Pits is fixed the *Muſculus Quadratus*, which has its Inſertion in the Under-Lip, which it draws downwards.

The *Sphincter* of the Lips incloſes and draws them together, juſt as the Strings do a Purſe: This Muſcle does not appertain to the Bones.

There are Sixteen Cavities or Holes which form a kind of Semicircle round the upper Part of the Jaw-bone, into which Sixteen Teeth are inchaſed.

In the Four anterior Cavities, are fixed the *Dentes Inciſores*. In the Two next following, the *Dentes Canini*; and in the other Cavities that go towards the Bottom of the Mouth, are placed the *Dentes Molares*.

The Bones of the under Jaw are oſſify'd from the Second Month: It conſiſts of Two Bones in new-born Children.

Of the TEETH.

There are moſt commonly Sixteen Teeth in each Jaw-bone, which are different in their Bigneſs and Figure. They are divided into the *Dentes Inciſores*, *Canini*, and *Molares*.

There are Four *Inciſores* or Cutters in each Mandible, which are placed before, and are flat and ſharp-edged, a little Convex on the exterior, and Concave on the interior Side.

There are Two *Dentes Canini* in each Jaw-bone, to wit, one on each Side: They are round and pointed at their Extremities. They are alſo called the Eye-Teeth, becauſe they have their Situation under the Eyes.

On each Side of the Jaw-bone, are Five *Dentes Molares*, or *Grinders*; they are large and uneven, and have an unequal Surface: They are placed in the poſterior Part of the Jaw, and have ſeveral Roots.

The Teeth of the upper Mandible have more Roots than the others; and their Roots are alſo deeper fixed, to keep them the more firm, becauſe the upper Jaw-bone is not ſo ſolid as the lower Jaw-bone.

The *Dentes Inciſores*, are beſt diſpoſed for cutting aſunder; the *Canini*, for to break and crack in Pieces; and the *Molares*, to grind. The Teeth ſerve alſo for an Ornament to the Mouth, and the better to articulate the Sound of the Words.

There are ſome of the *Dentes Molares* that have but one Root; theſe are placed neareſt to the *Canini*; and there are ſome *Dentes Molares* that have Two or Three Roots.

There are ſome of the *Dentes Molares*, the Roots of which come cloſe together at their Points, but ſtand aſunder at their *Baſis*, next to the *Body* of the Tooth: Theſe Teeth are very difficult to be drawn; becauſe, while the Jaw-bone is but tender, it grows within the Vacuity that is betwixt theſe Roots, ſo that it is almoſt impoſſible to draw out the Tooth, without pulling away at the ſame Time that Part of the Jaw-bone that

is fixed between the Roots. For I can't imagine that there are any Teeth that have a kind of Croſs-Bar which reaches from one Root to the other, as 'tis commonly believed they have.

There are ſome *Dentes Molares* with Two flat Roots, each of which ſeems to conſiſt of Two Roots joined together, their Separation being diſtinguiſhed by a long and ſmall Streak.

Some of them have Three Roots, which ſtand at a good Diſtance one from the other at their Extremities; but are nearer to one another towards the Body of the Tooth. Theſe Teeth are alſo very hard to be drawn, becauſe by their Bulk on the inferior Part, they tear the Jaw-bone aſunder; yet they are not quite ſo dangerous as the before-mentioned. The beſt Way is, after the Tooth is drawn, to preſs the Gums together with your Fingers, and conſequently the Aperture in the Jaw-bone, it being very ſpongious

The Roots of the *Dentes Molares* ſtand at a Diſtance from one another, the better to form a large *Baſis*, that may keep them the more firm within the Jaw-Bone; as alſo to prevent their piercing within the Subſtance of the Bone, when we are chewing ſome Things that are very hard. The Interſtices of the Roots are provided with a ſpongious bony Subſtance, which keeps them from being broken when they are compreſſed; becauſe this ſpongious Subſtance gives Way to the Preſſure that is made upon the Tooth.

The Roots of the Teeth in young People have their *Foramina* at the Ends, and at the whole Length of them, to give Entrance to a Nerve, and the Blood-Veſſels that give them Senſation and Nouriſhment. Theſe ſmall Conduits become leſs and leſs by Age, and at laſt quite diſappear; whence it is, that the Teeth of aged Perſons, being deſtitute of Nouriſhment, fall out.

There are ſome of the *Dentes Molares* that have Three Roots, but are ſo cloſely cemented together, that they make no more than one.

There are ſome *Dentes Molares*, the Roots of which are incurvated at the Ends like a Hook. Theſe can't be pull'd out without impairing the Jaw-bone, becauſe this ſmall Hook enters into a ſmall Cavity, which muſt be broken before the Teeth can be pulled out of its Socket.

Some of the *Dentes Molares* have only one ſhort and thick Root; theſe Teeth are of an equal Thickneſs from the Root to the very Top.

I ſaw once a *Dens Molaris* with Three Roots, one of the Roots of which was faſten'd to the Body of the Tooth, as if it had been cemented to it.

Some of the *Dentes Molares* have ſharp-edged Roots: The Roots of the great Teeth are not only hollow, but they have alſo a remarkable Cavity at the Bottom of the Body of the Tooth, which is inveſted with a Membrane, through which the Nerves and Blood-Veſſels are diſperſed.

There are ſome *Dentes Molares*, the Root of which is only biſed at the Extremity.

Some other *Dentes Molares* have Three Roots, but placed cloſe, one on the Side of the other.

There are certain *Dentes Molares* that do not appear till at Thirty Years of Age, called the *Dentes Sapientiæ*: They conſiſt only of what we call the *Body* of the Teeth; the *Baſis* whereof is excavated by Four ſmall Pits.

The Roots of the *Dentes Inciſores*, and of the *Canini*, are flat at the Sides, and placed with their flat Surfaces one cloſe to another, for their better Support.

At the Time of the firſt Formation of the Teeth, there is to be obſerved in each of theſe Cavities of the Jaw-bone, a certain ſoft and viſcous Matter, ſhaped like a Tooth, which may be called the *Seed* of it: It is incloſed within a mucilaginous Subſtance, which is interſperſed within a vaſt Number of Arteries, Veins and Nerves.

The firſt *Germen* grows hard firſt of all; and next, the mucilaginous Matter that ſurrounds it, prepares and furniſhes a new Juice, which is expanded over the Surface of the Tooth, and which frames as it were many *Leaves*, which by the Acceſſion of a new Juice which inſinuates itſelf within the Interſtices, and fills them up, forms one very compact and ſolid Layer of *Laminæ*; over which the Second Layer is formed, then a Third, and ſo divers others, which make up the whole Compoſition of the Bodies of the Teeth: So that the Teeth are nouriſhed

after

after a different Manner from what is obſervable in the other Bones.

The Teeth may be ſeparated into many *Leaves*; and in the Teeth of the young Animals, before they are cut, the exterior *Layers* are very tender, and eaſily to be ſeparated; whereas the interior are hard and oſſeous: For the firſt being form'd before the others, they have had more Time to become ſolid. But after they are come out of the Gums, the exterior Part of the Body of the Tooth is more compact and harder than the middle Part, which may be attributed to their being rubb'd together, and ſurrounded by the Air.

In Men, and in all other Animals that do ſhed their Teeth, there is a certain *Germen* or Seed, both for the Firſt, and for the Second Teeth.

The *Alveolus*, or Socket, within which the Root of the Tooth is fixed, is capable of being enlarged and contracted again: Whence it is, that the Teeth, after they are once looſe, are apt to be faſten'd again; becauſe the Fibres of the Gums grow bigger, according to the Supply of Nouriſhment they receive more at one Time than at another.

When a Tooth is drawn in a young Body that will not grow again, the Teeth approach nearer unto one another, ſo that by Degrees you can't perceive the Interſtice where the other Tooth had been placed before: But it does not happen thus in Perſons of a more advanced Age, becauſe the Jaw-bone is become too hard. However, the Edges of the Socket will draw near unto one another. The Gums are moſt cloſely ty'd to the *Baſis* of the Body of the Tooth, to ſome Inequalities which are obſervable there. They are faſten'd alſo to all the ſmall Prominencies which are at the Entrance of the *Alveolus*, which adds to the Stability of the Teeth.

The Teeth would have been uſeleſs to Babes; for their Stomach being incapable of digeſting any ſolid Meats, they can't therefore feed upon them; ſo that according as the Digeſtion increaſes in Children, they begin to be provided with ſmall Teeth, which may accuſtom them to the chewing of ſome ſlight Aliments.

The Teeth would not only have proved uſeleſs to the Babe, but alſo hurtful to the Nurſes Breaſts.

The firſt Teeth which are ſhed in Children, are without Roots; for, had they been provided with Roots, they would not have fallen out ſo eaſily, to make Way for the Second Teeth; which by this Means muſt have grown out of their right Poſition. Hence it is, that when we ſee one of the Second Teeth ready to come out, before the Firſt is ſhed, we muſt pull out the Firſt to make Way for the Second; which could not be done without Danger, if it had any Roots, by reaſon of the tender Age of the Child, and the Softneſs of the Jaw-bone.

The Teeth are not only ſerviceable in the chewing of the Aliments, but alſo in the diſtinct Pronunciation of Words. Beſides, that they are one of the beſt Ornaments belonging either to Men or Women.

The Bone of the Tooth is without Senſe in itſelf; but taking the Tooth as a Compoſition of a Bone, Veins, Arteries, Nerves, and Membranes which incloſe it, they are of ſo exquiſite a Senſe, that People ſometimes die of the Toothach.

The Teeth do differ from the other Bones, in that they are more white, more ſolid and harder. With one End they are fixed within a Cavity, and the other Part ſtands above it. They ſometimes grow again after they are fallen out, which can't be ſaid of any other Bones. The Teeth grow continually, which would be plainly perceiveable, were it not that they were worn away by their rubbing together whilſt we are chewing our Aliments. This is evidently to be obſerved in thoſe Teeth, the Oppoſite of which are fallen out or drawn; for they will grow ſometimes to ſuch a Length, that we are obliged to file them ſhorter.

When you file the Teeth, they are not ſenſible of it; becauſe the Nerves and other Parts which impart Senſation to them, don't reach to their Extremities.

The Teeth are not covered with the *Periſteum*, as the other Bones are. They appear in young Infants ſooner or later, according to their Strength: Some Children that are of a very ſtrong Conſtitution, are

born

born with Teeth in their Mouths: Moſt commonly they make their firſt Appearance at Four Months; but in ſome Children the firſt Teeth are not cut till in the Sixth or Seventh; nay, in the Twelfth or Fifteenth Month.

The firſt Tooth of all, moſt commonly appears before in the Mouth in the lower Jaw; and in Fourteen Days or Three Weeks after, a Second alſo in the lower Jaw.

After the Two inferior *Dentes Inciſores* have made their Appearance without the Gums, the Two *Inciſores* of the upper Jaw do appear alſo at the ſame Time; whereas thoſe of the lower Jaw don't cut through the Gums at once, but one after another. Then Two more Teeth come forth below on the Side of the firſt; and after them Two above. Next to the Four firſt, come forth the *Canini* below, and then the *Canini* above, which are call'd alſo the *Eye-Teeth*. The Teeth called the *Molares*, make their Appearance about Two Years of Age; to wit, Four above, and as many below; ſo that a Child has commonly Twenty Teeth, when it comes to be about Two Years old. The Children ſeldom ſhed their Teeth till about the ninth or tenth Year of Age, in the ſame Order as they appeared firſt, and others grow in their ſtead.

The Teeth are diſtinguiſhed into ſeveral Sorts, but eſpecially into *Great* and *Little*; beſides which, ſome Teeth are very broad, others very narrow.

Some Teeth again are ſlender and ſharp: When this laſt Sort of Teeth are placed pretty deep within the Sockets, when they are even and well ſet, they are accounted very good.

Some Teeth are fixed very cloſe to one another; and others again, which are not quite ſo cloſe; the latter are preferable to the former, becauſe thoſe that are too cloſe are apt to communicate the *Caries* to one another, and are not to be kept clean without much Difficulty.

However, thoſe Teeth that ſtand at ſome Diſtance one from the other, are not ſo apt to looſen as thoſe that are cloſer, becauſe their Sockets are ſtronger; but they have this Defect, That wanting a mutual Support, they are not in a Condition to reſiſt any external Force.

Thoſe Teeth that are ſet very cloſe together, are very apt to looſen, becauſe their *Alveoli* are weak; but then they have this Advantage, That they ſerve for Props one to the other.

If you would know what handſome Teeth are: They muſt be ſmall, well ſet, ſtreight, even, and at ſome little Diſtance from one another, and as white as Snow.

Of the OS HYOIDES.

The *Os Hyoides* is ſituated in the Bottom of the Mouth, betwixt the Tongue and the *Larynx*. It *Baſis* is like a roundiſh *Fork*, and its Two *Cornua* look towards the Bottom of the Throat, as the Baſis does to the exterior Part of the Throat. It conſiſts of Three Bones; to wit, of the *Baſis*, and Two others, which are call'd the *Cornua*, or Horns; unto which ſometimes are annexed divers other ſmall Bones, one at the End of the other.

The *Baſis* of the *Os Hyoides* is a pretty large Bone, rounded at the Back.

The *Cornua* of the *Os Hyoides*, are Two long and round Bones, each of which is conjoin'd with each of the Extremities of the *Baſis* of the *Os Hyoides*.

Betwixt the Two *Cornua* of the *Os Hyoides*, at the Place where they are articulated with the *Baſis* of the *Os Hyoides*, there is on each Side a very ſmall *Cornu*, or Horn, formed by a very ſmall Cartilage.

To the Point of the large offeous *Cornua* of the *Os Hyoides*, is faſten'd a very ſmall moveable Cartilage, which is tied to it by a Ligament.

To the Point of the ſmall moveable Cartilage, which is faſten'd to the Point of each of the *Cornua* of the *Os Hyoides*, there is tied a ſtrong, round, and long Ligament, which with its other Extremity is fixed to the upper *Cornu* of the *Thyroides*, one on each Side.

In the inferior Part of the *Baſis* of the *Os Hyoides*, there is a large round Cavity, which occupies the whole Space of the inferior Part of that *Baſis*. Within this Cavity is faſten'd a large Ligament, which, with its other Extremity, is tied to the very uppermoſt Part of the *Cartilago Thyroides*, at that Place where this Cartilage begins to be

forked

forked like an V, where it covers the whole Divarication.

Upon the anterior and middle Brim of the *Os Hyoides*, there is a long Ligament, which extends it self a good Way to the Middle of the Circles of the *Arteria Trachæa*.

To the anterior and middle Edge of the *Basis* of the *Os Hyoides*, there is fix'd a flat Ligament like a Riband, which at its other Extremity is tied to the superior and middle Part, and athwart to the *Epiglottis*.

On each Side of the Point in the Middle, upon the *Basis* of the *Os Hyoides*, at its anterior Part, the *Musculus Sternohyoidæus* is fasten'd, which has its Rise at the superior and anterior Part of the *Sternum*, and draws the *Os Hyoides* downwards.

On each Side of the *Musculus Sternohyoidæus* just upon the Edge of the *Basis* of the *Os Hyoides*, is fasten'd the *Coracohyoidæus*, which has its Origination at the Point of the *Apophysis Coracoides* of the *Omoplata*. It draws the *Os Hyoides* downwards.

On each Side of *Coracohyoidæi*, upon the Brink of the *Basis* of the *Os Hyoides*, is fasten'd the *Styloceratohyoidæus*; to wit, upupon the Articulation of the great *Cornu* with the *Basis* of the *Os Hyoides*, and is articulated with the *Apophysis Styloides*.

On each Side of the *Styloceratohyoidæus*; to wit, upon the Articulation of the small Cartilaginous Points, is fasten'd the *Geniohyoidæus*, which has its Rise on the interior Part of the Chin, upon the Inequalities which are upon the *Symphysis*. It draws the *Os Hyoides* upwards.

Quite athwart the Middle of the superior Part of the *Os Hyoides*, is plac'd the *Aponeurosis* of the *Musculus Mylohyoidæus*, which has its Origin at the inferior and interior Part of the Chin.

Of the LARYNX.

The *Larynx* is plac'd at the Bottom of the Mouth, before the Orifice of the *Oesophagus*. It consists of Five Cartilages:

The First is call'd the *Thyeoides*, or *Scutiformis*, being hollow on the Inside, and convex without, and distinguish'd into Two Parts by a Line. It has Four Angles.

The Two superior Productions of the *Thyroides* are longer than the inferior, and are join'd with the Sides of the *Os Hyoides*.

The inferior Productions of the *Thyroides* are conjoin'd with the *Cartilago Annularis*, or *Cricoides*.

The Second Cartilage of the *Larynx* is call'd the *Annular*, or the *Cricoides*. It is broad and thick behind, but narrow before.

The Third and Fourth of the Cartilages of the *Larynx* are call'd the *Arythenoides*, and are plac'd in the Cavity of the *Scutiformis*, in the superior Part of the Annular. They both together form that Chink which is call'd the *Glottis*.

The Fifth of the Cartilages of the *Larynx* is the *Epiglottis*, which resembles a small Ivy-Leaf, and is fasten'd to the concave Part of the *Scutiformis*. It opens and shuts the Orifice of the *Larynx*.

The *Musculus Sternohyoidæus* arises within and on the upper Part of the *Sternum*, and is inserted at the lower Part of the *Cartilago Scutiformis*, which it draws downwards.

The *Hyothyroidæus* has its Insertion in the *Basis* of the *Scutiformis*, and its Rise at the *Basis* of the *Os Hyoides*.

The *Cricothyroidæus Anterior* has its Origination at the fore Part of the Annular Cartilage, and its Insertion below, on the Side of the *Scutiformis*, which it dilates.

The *Cricothyroidæus Posterior* arises from the superior and posterior Part of the *Cartilago Annularis*, and is inserted in the superior and lateral Part of the *Scutiformis*, which it closes.

The *Cricothyroarythenoidæus Lateralis* arises from the interior and lateral Part of the *Cartilago Annularis*, and has its Insertion below and at the Side of the *Arythenoides*. It dilates the *Larynx*.

The *Arythenoidæus* has its Origination at that Place where the *Annularis* is conjoin'd with the *Arythenoides*, and is inserted in its superior and lateral Part.

CHAP

CHAP. III.

Of the THORAX.

THE Second Part of a Skeleton is call'd the *Thorax*, being a Compoſition of different Bones. Its Extent is from the Head to the *Coccyx*; and it is commonly divided into Three Parts; to wit, the *Spine*, the *Cheſt*, and the *Oſſa Innominata*.

Of the whole SPINE *in General.*

The whole *Spine* is diſtinguiſh'd into Five Parts; to wit, the *Neck*, the *Back*, the *Loins*, the *Os Sacrum*, and the *Coccyx*. This Column is the main Prop and Support of the Head, of the Arms, and of the Cheſt or Breaſt. Its whole Frame is a Compoſition of many Pieces, for the more convenient Motions of the Body. Theſe Pieces are call'd the *Vertebræ*; the biggeſt and moſt maſſy of which do form the *Baſis* of this Column, which was of Neceſſity to be large, being intended for a Support to all the reſt of this Frame.

As theſe *Vertebræ* riſe higher upwards, they loſe inſenſibly in their Bulk; ſo that this Column ends in a manner like a *Pyramid* at the Neck.

This Chain of the *Vertebræ* has a double Articulation with the Head: The Firſt is a *Ginglymus* with the Firſt *Vertebra*; and the Second Articulation is made with the Second *Vertebra* by Means of its *Apophyſis Odontoides*.

The *Vertebræ* in general do conſiſt of Two Parts; to wit, of their Bodies, and their *Apophyſes*.

The *Body* of the *Vertebræ* is a bony Maſs, even and flat at its Extremities, the better to unite them one upon the other.

The *Body* of the *Vertebræ* is the largeſt and interior Part of the *Spine*.

The ſuperior and inferior Surface of the Body of the *Vertebræ* is a hard and thin *Lamina*.

The *Body* of the *Vertebræ* is porous, and very ſpongious, which adds to its Lightneſs.

The Body of the *Vertebræ* is cover'd with a hard and ſtrong Membrane, which in all Probability is no more than a Production or Expanſion of the Ligaments, which tie them together.

There are certain bony Elongations, which do form the poſterior Part of the Spine of the Back; which are call'd the *Apophyſes*.

Each *Vertebra* has Seven *Apophyſes*; to wit, Four oblique, Two of which are *aſcending*, and Two *deſcending*; Two tranſverſe; and One ſtreight, call'd the *Spine*, or *Spinous*, which has given the Name of the *Spine* to this whole Column.

The Aſcending Oblique *Apophyſes* aſcend from below upwards, and the Deſcending deſcend from above downwards.

The Two Tranſverſe *Apophyſes* are the Horizontal Elongations on each Side.

The ſtreight *Apophyſis*, call'd the *Spinous*, is ſituated directly at the Middle of the poſterior Part of the *Vertebra*.

Each *Vertebra* is perforated in its Middle by a large Hole; ſo that all the *Vertebræ* being plac'd one upon another, and theſe Holes being placed exactly one to another, do form a long Conduit or Pipe, through which the Spinal Marrow does paſs. This Pipe loſes nothing of its Bulk, being as large at its Beginning, or the ſuperior Part, where the *Vertebræ* are much ſmaller, as at its End where they are much bigger.

Through the whole Length of this Column, there are on each Side, Holes, each of which is formed by the Conjunction of Two *Vertebræ*. Theſe Holes open in the Conduit, to give Egreſs to the Nerves that come from the Spinal Marrow, and the ſanguineous Veſſels that carry Nouriſhment to the Marrow. Theſe Holes are made by

the Conjunction of the Two Demi-holes of the Bodies of the *Vertebræ*, ſo that the Demi-Hole of the inferior Part of the ſuperior *Vertebra*, and another of the ſuperior Part of the inferior *Vertebra*, make up one entire Hole; and ſo with the reſt.

The *Vertebræ* are conjoin'd by a double reciprocal Articulation; to wit, one by their *Apophyſes*, the other by their Bodies.

Their Articulation, which is made by the Means of the *Apophyſes* of the *Vertebræ*, is a double *Arthrodia*, which has a Relation to the Firſt Sort of a *Ginglymus*. For though the *Ginglymus* has no other Motion but the Flexion and Extenſion, yet the Spine does turn towards the Sides; the Reaſon of which is, becauſe their Heads and Cavities are flat and ſuperficial, and their Articulation is looſe: So that though its chief Motions are the Flexion and Extenſion, it does nevertheleſs move alſo a little ſideways to the Right and the Left.

The Articulation which is made by the Means of the Body of the *Vertebræ*, is a *Synchondroſis*, *i. e.* by Means of a large Cartilage, which occupies the Interſtices of the *Vertebræ*, and ties and unites them together, and that in ſuch a Manner, as to give way to the Motions of the Spine. This Cartilage facilitates and accelerates the Motions of the Spine, and prevents the *Vertebræ* from rubbing againſt one another without Interminſion.

There is but One Cartilage in each Interſtice of the *Vertebræ*, quite otherwiſe than what is obſervable in other Articulations which are perform'd with a Motion, to render the Spine the more ſtrong and firm.

Beſides the Cartilages that are plac'd in the Interſtices of the *Vertebræ*, this Articulation is corroborated by ſtrong Ligaments, which ariſing at the Body of the ſuperior *Vertebra*, are inſerted into the Body of the inferior *Vertebræ*; and ſo with the reſt ſucceſſively.

The Motion of the whole Spine in general is very evident; though that of each *Vertebra* in particular is very inconſiderable.

The Motion of the Spine is the greater in each Part, conſidering that the Cartilages are thick, the Spinous *Apophyſes* ſtreight and blunt, and plac'd at a Diſtance from one another.

The whole Column of the Spine is of the Figure of a double *Roman* S.

The Spine does bend inwards at the Neck, for the ſupporting of the *Aſpera Arteria*, the *Oeſophagus*, and divers Nerves, and other Veſſels.

The Spine jets outwards at the Back, to increaſe the Capaciouſneſs of the Breaſt.

At the Loins it bends inwards, at the *Os Sacrum* outwards, and at the *Coccyx* inwards again.

Of the Firſt VERTBRA *of the Neck.*

The Firſt *Vertebra* of the Neck is call'd the *Atlas*, becauſe it ſupports the Head. It has no ſpinous *Apophyſis*, which would impair the Action of the ſmall Muſcle which goes from the Second *Vertebra* to the *Occiput*. It has only a ſmall Prominency, unto which this *Muſculus Minor Rectus* is faſten'd.

On the Side of the great Hole of this *Vertebra*, through which the Spinal Marrow does deſcend, there are Two flat Cavities, cover'd with a Cartilage. Within each of theſe Two Cavities, the Two *Apophyſes Coronoides* of the *Occiput*, upon which the Head performs it Motions, are articulated.

The oblique aſcending *Apophyſes*, are thoſe Two large Protuberancies that are placed on each Side of the great Hole, through which the Spinal Marrow does deſcend, and upon which are to be obſerved Two flat Cavities, within which the *Apophyſes* of the *Occiput* are articulated.

Immediately under the Two aſcending *Apophyſes*, there are Two others, hollow'd out with Two Cavities, with ſome Inequalities. Theſe are call'd the Oblique Deſcending *Apophyſes*; and in theſe Two Cavities, the Aſcending *Apophyſes* of the Second *Vertebra* are inarticulated: So that the Firſt *Vertebra* has this peculiar to it ſelf, That it receives on its ſuperior Part the *Occiput*, and on its inferior Part the ſecond *Vertebra*, without being received; whereas each of the other *Vertebræ* receives the *Vertebra* that is next above it, and is received within the next inferior *Vertebra*. 'Tis further to be obſerved, That the Cavities of the ſuperior aſcending *Apophyſes*, which ſupport the Head, are ſmooth and almoſt round; whereas the Cavities

that

that are in the inferior *Apophyſes* are oval and rugged on the Side of the great Hole of the Spinal Marrow; by which you may know the true Poſition of this *Vertebra*, when you are to collect the Bones of a Skeleton.

On each Side of the aſcending *Apophyſes* there is a ſmall Trench, which begins at the Edge of the Hole wherewith each of the tranſverſe *Apophyſes* is perforated, and goes backwards. Through this ſmall Gutter the Vertebral Artery and the Tenth Pair of Nerves take their Paſſage, which prevents theſe Veſſels from being wounded.

In the interior and anterior Part of the bony Circle, which forms the Body of this *Vertebra*, there is a very ſuperficial Cavity, into which is received the *Dens* of the Second *Vertebra*. Sometimes this Cavity is hollow'd within a ſmall round Prominency, which ſometimes is found in the interior Part of this *Vertebra*.

Quite behind, and in the Middle of the bony Circle of the Firſt *Vertebra*, there is a ſmall Prominency, which ſometimes appears to be bifid, which here ſerves inſtead of the *Spinous Apophyſis* which is to be found in the other *Vertebræ*. From this ſmall *Apophyſis* the Two *Muſculi Recti Flexores Capitis* have their Rife.

'Tis further obſervable, That the greateſt Part of the Circle which forms the Body of the Firſt *Vertebra*, does form alſo its poſterior Part; and that it is the leaſt Part of it which forms the anterior Part.

The Two large *Apophyſes* which extend Horizontally on each Side of the Firſt *Vertebra*, are call'd the tranſverſe *Apophyſes*. Juſt at the Root of the tranſverſal *Apophyſis* of the Firſt *Vertebra* of the Neck, a ſmall Muſcle, not above Four Lines in Breadth, has its Origination on each Side, which runs obliquely, and is faſten'd on the Inſide, in a ſmall oval ſuperficial Cavity, before the *Apophyſis Coronoides*. This Muſcle has of late been call'd the *Frænator Obliquus*.

Upon the Extremity of the tranſverſe *Apophyſis* of the Firſt *Vertebra* of the Neck, takes its Origin on each Side a large carneous Muſcle of the Breadth of an Inch, which ſtretches perpendicularly, and is fixed below the *Apophyſis Styloides*; to wit, betwixt the *Apophyſis Maſtoides* and the *Coronoides*, which has been call'd of late the *Frænator Rectus Flexor Capitis*.

At the Point of the tranſverſe *Apophyſis* of the Firſt *Vertebra* of the Neck; to wit, at the Place where the *Obliquus Major* and *Minor* is fixed, a very ſmall Muſcle, of the Breadth of about Two or Three Lines, has its Riſe, and is inſerted obliquely behind the *Apophyſis Maſtoides*, which has of late been call'd the *Frænator Poſterior*. It pulls the Head backwards at the ſame Time when we turn our Chin downwards towards the Breaſt. This Muſcle is ſometimes wanting.

On the Side of the ſmall Protuberancy, which to the Firſt *Vertebra* of the Neck ſerves inſtead of the Spinous Proceſs, has its Origination a round Muſcle of the Bigneſs of a Writing Pen, which is inſerted obliquely at the inferior and lateral Part of the *Occiput*, underneath that Place where the *Muſculus Minor Obliquus* and the *Major Rectus* are faſten'd. This Muſcle has of late been call'd the *Auxiliaris* of the *Obliqui Majores* and *Minores*, becauſe it aſſiſts them in their oblique Motions. Sometimes it is ſingle, and ſometimes there is none at all.

At the ſuperior, middle, and anterior Part of the Firſt *Vertebra* of the Neck, there is moſt commonly a ſmall very rugged Prominency, unto which is fix'd a Ligament of an Inch in Length, and of the Thickneſs of a Writing Pen, which, with its other Extremity, is tied to the middle Part of the Elongation of the *Occiput*. This Ligament ſerves to faſten moſt firmly the *Os Occipitis* to the Firſt *Vertebra*. It prevents the Head alſo from falling at too great a Diſtance from the Firſt *Vertebra* when we move it backwards, which elſe would cauſe a Compreſſion upon the Marrow.

At the inferior, middle, and anterior Part of the Firſt *Vertebra* of the Neck, there is faſten'd a broad and ſhort Ligament, which at its other End is tied to a ſmall Prominency, which ſtands in the Middle and betwixt the Two tranſverſal *Apophyſes* of the Second *Vertebra*, on the fore Part.

The *Major Obliquus* is faſten'd to the Extremity of the tranſverſe *Apophyſis* of the Firſt *Vertebra* of the Neck, and at the Side of the Spinous *Apophyſis* of the Second *Vertebra*.

The *Minor Obliquus* has its Origination at the Extremity of the tranſverſe *Apophyſis* of the Firſt *Vertebra* of the Neck, and its Inſertion at the inferior and lateral Part of the *Occiput.*

In the great Hole or Cavity of the Firſt *Vertebra*, through which the Marrow does deſcend, there is on each Side of the aſcending *Apophyſes* a ſmall round Prominency, unto which is faſten'd on each Side a round Ligament, which keeps the *Dens* of the Second *Vertebra* within its Bounds; to wit, in the ſmall Cavity of the Firſt *Vertebra*, without which, this *Dens* would cauſe a Compreſſion upon the Marrow in its Motions.

In the Middle and fore Part of the Firſt *Vertebra* there is a ſmall Prominency, unto which the Tendon of the Muſcle call'd *Longus*, or *Rectus*, which is ſituated under the *Oeſophagus*, is fix'd.

Under the oſſeous Circle, on the poſterior Part of the Body of the deſcending *Apophyſis*, there is a large Furrow, which ſometimes makes a Hole, through which the Vertebral Artery takes its Paſſage. It winds upon the firſt *Vertebra*, betwixt that and the *Os Occipitis*, without being impaired by the Motions of the Head.

The Tenth Pair of Nerves takes its Paſſage alſo betwixt the *Occiput* and the Firſt *Vertebra.*

Of the Second VERTEBRA *of the Neck.*

Upon the fore and middle Part, and betwixt the Two tranſverſe Proceſſes of the Second *Vertebra* of the Neck, there is a long *Apophyſis*, which from its Figure has obtain'd the Name of *Odontoides*, or *Dentiformis.*

On each Side of the *Apophyſis Odontoides* there is a ſmall Prominency, unto which a round Ligament is faſten'd, which with its other Extremity is tied to each Side of the great *Foramen* of the *Occiput*, through which the Marrow does deſcend; to wit, on each interior Side of the *Apophyſes Glenoides.*

Upon the Middle of the anterior Part of the *Apophyſis Odontoides*, there is a ſmall Prominency, which is inchas'd in a ſmall Cavity or Pit, which is plac'd on the poſterior, interior, and middle Part of the Circle, and makes the *Body* of the Firſt *Vertebra.*

Upon the *Body* of the Second *Vertebra*, on its fore Part; to wit, betwixt the Two tranſverſal *Apophyſes* of the Second *Vertebra*, there is a ſmall Prominency, upon which is faſten'd a ſhort, ſtrong, and broad Ligament, which with its other End is fix'd to the inferior, middle, and anterior Part of the Firſt *Vertebra.*

Upon the Side of the *Spinous Apophyſis* there is a ſmall ſuperficial Pit, in which is couch'd the *Major Obliquus*, which has its Inſertion at the Extremity of the tranſverſal *Apophyſis* of the Firſt *Vertebra.*

The *Muſculus Major Rectus* has its Riſe at the Spine of the Second *Vertebra* of the Neck.

Of the Seven VERTEBRÆ *of the Neck in General.*

All the aſcending *Apophyſes* of the *Vertebræ* of the Neck are ſomewhat rounded.

All the deſcending *Apophyſes* of the Six inferior *Vertebræ* of the Neck are hollow'd.

All the tranſverſe *Apophyſes* of the Seven *Vertebræ* of the Neck are perforated, and all together do form a Conduit or Channel, through which the *Arteriæ Cervicales*, that aſcend to the Brain, take their Paſſage.

The Spinous *Apophyſes* of the Six inferior *Vertebræ* of the Neck, have a hollow Gutter all along and under their *Spines*, which receives the *Dorſum* of the inferior *Vertebra.*

The *Body* of the *Vertebræ* of the Neck is not ſo much rounded as that of the Back and the Loins. It is ſomewhat ſquare.

The Spinous Proceſſes of the Six inferior *Vertebræ* of the Neck are bifid.

The Spine of the Second *Vertebra* of the Neck is more forked, and has alſo a larger Gutter than the Five inferior Spinous *Apophyſes.*

The Spinous Proceſs of the Seventh and Inferior *Vertebra* of the Neck, is moſt commonly forked only a little below; whereas the Six Superior have large Divarications at their Extremities.

'Tis very rare to meet with Eight *Vertebræ* of the Neck; and whenever it happens ſo, there are only Eleven belonging to the Back; and then the Perſon is ſubject to

Diſſ-

Difficulty of Reſpiration, becauſe the Breaſt is ſtreighten'd by the Defect of One *Vertebra*.

The *Muſculus Splenius* has its Origination at the Spines of the Four laſt inferior *Vertebræ* of the Neck.

The *Complexus* ariſes at the tranſverſe Proceſſes of the Four laſt *Vertebræ* of the Neck.

The *Muſculus*, call'd the *Longus*, is ſituated under the *Oeſophagus*, and lodged on the Side of all the *Vertebræ* of the Neck, and has its Inſertion at the Firſt *Vertebra* in a ſmall Pit.

The *Scalenus* is inſerted at the forked Ends of the tranſverſe Proceſſes of all the *Vertebræ* of the Neck.

The *Tranſverſus* has its Inſertion into the tranſverſe Productions of all the *Vertebræ* of the Neck.

The *Spinator Colli* fills up all the Spaces betwixt the Spines of the *Vertebræ* of the Neck, and is faſten'd very cloſely to the *Proceſſus Odontoides*.

The inferior Part of each *Vertebra* of the Neck jets out below into a Cavity, that is in the ſuperior Part of the inferior *Vertebra*.

The Cartilages that are plac'd betwixt the *Vertebræ* of the Neck are very thick, the better to facilitate the various Motions of the Neck.

The ſtreight Spinous *Apophyſes* are bifid as well as the tranſverſe, for the Origination and Inſertion of the Muſcles.

The tranſverſe *Apophyſes* are perforated, and do form a Pipe or Channel for the Paſſage of the *Arteriæ* and *Venæ Vertebrales*.

The *Muſculus Scalenus Depreſſor Colli* is fix'd to the forked Extremities of the tranſverſe *Apophyſes* of the Three or Four ſuperior *Vertebræ* of the Neck.

The *Muſculus Longus* or *Rectus* is lodged upon the Body of all the *Vertebræ* of the Neck.

The *Spinator* is fix'd to the Spinous *Apophyſes* of the Six laſt *Vertebræ* of the Neck.

The *Muſculus Tranſverſus Levator Colli* is faſten'd to the tranſverſal *Apophyſes* of all the *Vertebræ* of the Neck on the Inſide.

Of the Twelve VERTEBRÆ *of the Back.*

The Twelve *Vertebræ* of the Back turn outwards, to enlarge the Capaciouſneſs of the Breaſt.

Their Body is bigger than that of the *Vertebræ* of the Neck; but the Body of the *Vertebræ* of the Back is ſmaller than that of the Loins.

The Spinous Proceſſes of the Twelve *Vertebræ* of the Back are plac'd cloſe upon one another, and the Cartilage that is ſituated betwixt the *Body* of each *Vertebra* is very thin; which is the Reaſon that the Motion of the Back in that Part is very obſcure or inconſiderable.

On each Side of the Body of the *Vertebræ*, there is a Cavity which receives the Head of a Rib.

There is a Cavity on each tranſverſe *Apophyſis*, which receives the Prominency of a Rib for its Articulation.

The Firſt among theſe Twelve *Vertebræ* has its Spinous Proceſs more ſtreight than the reſt, and it is rounded at the End; whereas thoſe of the others are either ſharp-pointed or flat.

The Second *Vertebra* of the Back is call'd the *Axillaris*, becauſe it ſtands even with the Arm-pits.

The Twelfth *Vertebra* of the Back is call'd the *Præcingens*, becauſe it is plac'd at the Girdle.

The oblique *Apophyſes* of the Twelfth *Vertebra* are ſhort and more round than thoſe of the others.

'Tis very ſeldom that Thirteen *Vertebræ* are obſerv'd in the Back, and much ſeldomer Eleven.

The Spinous *Apophyſes* of the Twelve *Vertebræ* of the Back are not bifid, like thoſe of the Neck.

The Stomach has its Beginning near the Eleventh *Vertebra* of the Back.

The *Pleura* begins at the *Vertebræ* of the Back, and riſes on each Side towards the Middle of the *Sternum*, where it is doubled.

The

The *Thymus* is ſituated in the ſuperior Part of the *Thorax*, in that Part where the *Arteriæ* and *Venæ Subclaviæ* begin to divaricate.

The *Pſoas* or *Lumbaris*, is placed upon the Body of the Two laſt *Vertebræ* of the Back, one on each Side laterally.

The *Serratus Poſterior Superior*, is faſten'd to the ſpinous *Apophyſis* of the Firſt *Vertebra* of the Back.

The *Serratus Inferior Poſterior*, is fixed to the ſpinous Proceſſes of the Three lowermoſt *Vertebræ* of the Back.

The *Muſculus Sacer* is faſten'd to the Spine of the Twelfth *Vertebræ* of the Back.

The *Demi Spinalis* is fixed to the ſpinous *Apophyſes* of the *Vertebræ* of the Back.

The *Muſculus Longus*, or *Rectus*, is ſituated under the *Oeſophagus Flexor Colli*; it is placed on each Side of the *Body* of the Four or Five firſt *Vertebræ* of the Back on the Inſide, and upon the Body of all thoſe of the Neck.

The *Spinalis* is faſten'd to the ſpinous *Apophyſes* of the Five firſt *Vertebræ* of the Back.

The *Tranſverſus* is fixed to the tranſverſal *Apophyſes* of the Six ſuperior *Vertebræ* of the Back, on the Outſide.

The *Splenius* is fixed to the ſpinous Proceſſes of the Five firſt *Vertebræ* of the Back.

The *Complexus* is fixed to the ſpinous Proceſſes of the Five firſt *Vertebræ* of the Back.

The *Arteria Trachæa* deſcends from the *Larynx* to the Fourth *Vertebra* of the Back, where it divaricates into Two Branches.

Of the VERTEBRÆ *of the Loins.*

There are Five *Vertebræ* belonging to the Loins, the Body of which is much broader than that of all the other *Vertebræ* of the Spine.

The Cartilages that are placed betwixt the *Vertebræ* of the Loins, are much thinner than thoſe of the other *Vertebræ*.

The ſpinous *Apophyſes* of the *Vertebræ* of the Loins, are pretty long, large and flat, quite ſtreight, and placed at a good Diſtance from one another.

The tranſverſal *Apophyſes* of the Loins are long and flat, as if they were ſmall Ribs framed for the Lodging of many Muſcles, and the ſuſtaining of the *Viſcera*.

The aſcending *Apophyſes* of the *Vertebræ* of the Loins are excavated, for to receive; and the deſcending a little rounded, for to be received.

The Articulation of the *Vertebræ* of the Loins is diſpoſed in ſuch a Manner, as to be capable of all Sorts of Motions. This is owing to the Diſtance there is betwixt their ſpinous Proceſſes, and the Largeneſs of the Cartilages, on which all the Motion of the Spine does depend, which is either leſs or more free, according as the ſpinous *Apophyſes* are at a greater or ſmaller Diſtance one from another, and the Cartilages either thicker or thinner.

The *Venæ Lumbares* enter into the Trunk of the *Vena Cava*, betwixt the Four *Vertebræ* of the Loins, through the *Foramina* deſign'd for the Nerves.

The *Iliack* Veins begin near the Fifth *Vertebra* of the Loins.

The Stomach reſts upon the Firſt *Vertebra* of the Loins.

The *Duodenum* is tied to the *Vertebræ* of the Loins by membranous Ligaments.

The *Meſenterium* has its Beginning at the Firſt and Third *Vertebræ* of the Loins.

The *Muſculus Pſoas*, or *Lumbaris*, is placed upon the Body of all the *Vertebræ* of the Loins on the Inſide, one on each Side.

The *Serratus Poſterior Inferior*, is faſten'd to the ſpinous *Apophyſis* of the Firſt *Vertebra* of the Loins.

The *Sacrolumbaris* is fixed to the Spines of the *Vertebræ* of the Loins.

The *Triangularis*, or *Quadratus Flexor Lumborum*, is faſten'd to the tranſverſal *Apophyſes* of the *Vertebræ* of the Loins.

The *Sacer Extenſor* of the Loins, is faſten'd to the tranſverſe Proceſſes of the *Vertebræ* of the Loins.

The *Demi Spinalis* is fixed to the ſpinous Proceſſes of the *Vertebræ* of the Loins.

The *Muſculus Tranſverſus* is faſten'd to the tranſverſe *Apophyſes* of the *Vertebræ* of the Loins.

Of

Of the OS SACRUM.

The *Os Sacrum* conſiſts of Four or Five *Vertebræ*, conjoin'd together by a *Synchondroſis*, ſo that they are in Effect but one ſingle Bone

It is very thick, Convex without, and Concave within, for the Enlargement of the Cavity of the *Pelvis* or Baſon.

This Bone has very large *Foramina* on its anterior and poſterior Parts, but none on the Sides, which would impair its Articulation with the *Oſſa Ilium*.

The *Os Sacrum* has Four or Five Holes before, and Four or Five behind, Four in each Row.

All along to the poſterior Side of the *Os Sacrum*, there is faſten'd a ſtrong and thick Ligament, which with its ſuperior Extremity is faſten'd to the poſterior End of the Circumference of the *Os Ilium*; and with its inferior End, to the Protuberancy of the *Os Iſchium*.

The *Inteſtinum Rectum* is tied to the *Os Sacrum* and the *Coccyx*, by Means of the *Peritonæum*.

The *Pyriformis*, which is the firſt among the *Quadrigemini*, is placed at the middle, lateral and exterior Part of the *Os Sacrum*, where the *Os Ilium* is conjoined with it.

The *Sacrolumbaris* is faſten'd to the poſterior Part of the *Os Sacrum*.

All along the whole *Os Sacrum* there is a long Hole, reaching from above downwards: The Spinal Marrow does not paſs through this Hole, as it does through the whole Length of the Pipe of the *Spine*; but it gives Paſſage to Six large Strings of the Nerves.

Through the Four Pair of the large poſterior Holes, Four Bundles of Nerves have their Egreſs.

Near the Articulation with the *Coccyx*, there is a Chink which gives Egreſs to the Fifth Pair of Nerves.

The Sixth Pair goes out through an odd *Foramen* or Hole that is in the middle of the Bone, and is inſtead of the great Hole of the *Vertebræ*.

The Four anterior Holes of the *Os Sacrum* are cloſed up by Membranes; neither do they give Paſſage to any Nerves, as the Ancients believed they did, becauſe they are much bigger than the poſterior Holes. They tell us, That theſe Holes were deſign'd only to make the Bone the lighter.

At the ſuperior and poſterior Part of the *Os Sacrum*, there are Two *Apophyſes*; to wit, one on each Side of the great Hole, that reaches from above downwards: Each of theſe have Two Cavities, and one Prominency, in order to receive the Two Cavities and the Two Prominencies of the *Os Innominatum*, which make a *Ginglymus*.

All along this Bone, on each Side of the poſterior Part, there are certain Prominencies, call'd the Oblique *Apophyſes*.

All along the middle and poſterior Part of the Bone, to wit, betwixt the Two Rows of the Holes, there are ſome Prominencies, which are called the Spinous Proceſſes.

The *Os Sacrum* does form Part of the Cavity of the *Hypogaſtrium*, call'd the *Pelvis*, or Baſon, and ſerves to ſuſtain the *Inteſtinum Rectum*, the Womb in Women, and the Bladder.

The *Vertebræ* of the *Os Sacrum* grow ſmaller as they reach lower, ſo that it terminates in a pointed Edge below.

At the ſuperior and lateral Part of the *Os Sacrum*, there is on each Side a large flat Sinuoſity, which receive the Prominencies of the *Os Ilium*.

The *Os Sacrum* terminates with Two *Cornua* or Horns, which are placed at the Side of the great *Foramen* of this Bone; a round Ligament is faſten'd to them, which with its other End is tied to the poſterior Prominency, or the ſuperior Part of the *Os Innominatum*.

To the lowermoſt End of the *Os Sacrum* is faſten'd, by a very looſe Connexion, a Cartilage which unites the *Coccyx* with it.

The *Muſculus Sacer* is faſten'd to the hinder Part of the *Os Sacrum*, by a ſharp-pointed Origination.

Of the COCCYX.

The *Coccyx* adheres to the Extremity of the *Os Sacrum*: It has derived its Denomination from its Reſemblance to the Beak of a Cuckow.

In young Infants it conſiſts of ſeveral Pieces; but in Adults, of one only.

The

The *Coccyx* bends inwards, for the Support of the *Inteſtinum Rectum*, and gives Origination to the *Levatores Ani*.

All along to the lateral Part of the *Coccyx*, is faſten'd the *Muſculus Glutæus*.

The *Muſculus Sphincter*, and the *Inteſtinum Rectum*, are tied alſo to the *Coccyx*.

At the ſuperior Part of the *Coccyx*, there is a ſmall *Sinus*, which receives the laſt *Vertebra* of the *Os Sacrum*.

When the *Os Sacrum* conſiſts of Five *Vertebræ*, the ſuperior Part of the *Coccyx* has Two ſharp-pointed *Apophyſes*, which ſtretching upwards, are conjoin'd with the Fifth *Vertebra* of the *Os Sacrum*, and make a *Foramen*, which gives Paſſage to the Sixth Pair of Nerves of the *Os Sacrum*.

The *Inteſtinum Rectum* is faſten'd to the *Coccyx* by the *Peritonæum*.

Of the RIBS.

There are Four and twenty Ribs in all to wit, Twelve on each Side, and are of a Semicircular Figure. They are diſtinguiſh'd into the *True* and *Falſe*, or *Spurious* Ribs.

The Seven ſuperior Ribs on each Side are the *True*, ſo call'd, becauſe they are conjoin'd on their anterior Part with the *Sternum*, by Means of ſome ſmall oblique Cartilages.

The Five inferior Ribs on each Side are call'd the *Spurious*, becauſe they have no Connexion with the *Sternum*, their Cartilages being conjoin'd one upon another. But after all, if you take a narrow View of them, you will find the Extremity of the Superior among them to be tied to the Extremity of the *Sternum*.

All the Ribs are articulated before by *Synchondroſis*; to wit, the *True* immediately with the *Sternum*, and the *Spurious* by the Intervention of a *Medium*.

All the Ribs are articulated on their poſterior Parts with the *Vertebræ* of the Back by *Ginglymus*; to wit, by its Second Kind.

Each Rib has Two Extremities, one before, and the other behind. The Middle of the Rib is call'd its *Body*.

The anterior Extremity of the Ribs, which reaches to the *Sternum*, ends in an oblique Cartilage, to facilitate Reſpiration.

The poſterior Extremity of the Ribs; to wit, that towards the Back, is hard, ſolid, narrow, and unequal, for its better Articulation with the *Vertebræ*, and to give Origination and Inſertion to ſome Muſcles, and to the Ligament that ſtrengthens their Articulation.

The poſterior Extremity of the Ribs is roundiſh, and enters into a ſuperficial Cavity, which is on the poſterior Part of the *Body* of the *Vertebra*.

At about an Inch's Diſtance from the poſterior Extremity of the Rib, there is a Prominency, which is inſerted into a Cavity of the tranſverſe *Apophyſis* of the *Vertebra*.

At the inferior and interior Part of each Rib, there is a long Trench, through which paſſes an intercoſtal Vein, Artery and Nerve.

The inferior and interior Part of each Rib, which is next to the Breaſt, is called the *Interior Lip*; and the inferior and exterior of each Rib, the exterior *Lip*.

The *Lips* give Originations and Inſertions to the Intercoſtal Muſcles, which fill up the Interſtices of the Ribs.

The middle Part of the Rib is round towards the Spine, but it grows flatter where it comes nearer to the *Sternum*.

All the Ribs together do form that great Concavity which is call'd the *Thorax*.

The *Omoplata* has its Poſition upon the back, betwixt the Firſt and the Fifth Rib of the *Thorax*. It ſeldom reaches to the Sixth.

Near the *Apophyſis* of the Ribs, which enters into a Cavity of the tranſverſe Proceſſes of the *Vertebræ*, the Rib is rugged on its poſterior Part for the Space of an Inch. Unto theſe Unequalities is faſten'd the Ligament which ties the Rib to the *Vertebra*.

The Seven ſuperior *true* Ribs are articulated with the *Sternum* within certain Cavities that are placed all along its Sides, which receive the ſmall Heads of the Cartilages of the Ribs.

The Twelfth, or the lowermoſt Rib of all, is not join'd either with the *Sternum*, or with the other *ſpurious* Ribs on their fore Part.

The Tenth Rib is ſeldom join'd with the *Vertebra* by Two Articulations, but commonly by One.

The Eleventh and Twelfth Ribs are conjoin'd only with the *Vertebra* by one ſingle Articulation, to wit, within the *Sinus* of the Body of the *Vertebra*.

The *Sinus* of the *Vertebra* that receives the Firſt Rib, is ſituated wholly in the *Body* of the *Vertebra*; but the Eight next following are not altogether upon the *Body* of the *Vertebra*.

The Firſt and Second Ribs are the ſhorteſt of all the Ribs.

The Intercoſtal Veins occupy the Intervals of the Ten inferior Ribs.

The Roots of the ſuperior Intercoſtal Vein have their Beginning betwixt the Interſtices of the Three and the Four ſuperior Ribs.

The *Muſculus Intercoſtalis Superior* has its Origin at the Interſtices of the Three Superior Ribs.

The Roots of the Internal Mamillary Vein have their Beginning at the Extremities of the Cartilages of the Ribs, at the Intercoſtal Interſtices, and the Glands of the Breaſts.

The *Muſculus Subclavius* has its Inſertion at the Firſt Rib, near the *Sternum*, on the upper Part.

The *Serratus Major* has its Situation upon the Five true inferior Ribs, and upon the Two ſpurious ſuperior Ones.

The *Serratus Poſterior Superior* is faſten'd to the Four ſuperior Ribs backwards.

The *Serratus Poſterior Inferior* is fix'd to the Four inferior Ribs.

The Eleven *Intercoſtales Externi* occupy the Interſtices of the Twelve Ribs, and are faſten'd to the inferior and exterior Part of each ſuperior Rib, and to the exterior and ſuperior Part of each inferior Rib.

The *Muſculus Triangularis* is faſten'd to the Cartilages of the Two ſuperior Ribs, on the inner Side, near the *Sternum*.

The *Sacrolumbaris* is plac'd upon the inferior Ribs near their Articulation.

The Eleven *Intercoſtales Interni* are fix'd to the ſuperior Part of each inferior Rib, and to the inferior and interior *Lip* of each ſuperior Rib. They fill up the Interſtices of the Cartilages which conjoin the Ribs with the *Sternum*. The *Externi* do not extend ſo far.

The *Diaphragma* is with its ſuperior Part faſten'd to the Ribs, and with its inferior to the *Vertebræ* of the Loins.

The *Obliquus Externus Abdominis* is faſten'd to the inferior Part of the Two *true* Ribs, before they begin to be cartilaginous, and of the Five *ſpurious* on that Part where they begin to be cartilaginous.

The *Obliquus Internus Aſcendens* is faſten'd to all the *ſpurious* Ribs.

The *Muſculus Tranſverſalis Abdominis* is faſten'd to the *ſpurious* Ribs on the inner Side.

The Two *Recti Abdominis* are fix'd to the Cartilage of the Four laſt *true* Ribs.

The *Scalenus* draws down the Neck. Its anterior Part is fix'd to the ſuperior and middle Part of the Firſt Rib.

Of the STERNUM, *or* BREAST-BONE.

The *Sternum* does form the fore Part of the Breaſt.

In Infants it conſiſts of divers Pieces, which are cartilaginous; but in Perſons of an advanced Age, of Two Bones, which are very porous and ſpongious, and are conjoin'd by a *Synchondroſis*.

The Firſt Bone of the *Sternum*, which is plac'd at the ſuperior Part of the Breaſt, is the ſmalleſt.

There is a Cavity in the ſuperior and interior Part of the *Sternum*, which gives Paſſage to, and is a Receptacle of, the *Arteria Trachæa*.

On its ſuperior Part it has a ſuperficial Cavity on each Side, which receives the *Clavicula*.

On the inferior and lateral Part there is a Cavity on each Side of the upper Bone of the *Sternum*, which receives the Extremity of the Firſt Rib.

The Second Bone of the *Sternum*, or the Inferior, has Six Notches or Pits at its whole Length on each Side, into which the Six *true* Ribs are received.

At the undermoſt Part of the *Sternum* there is on each Side a Notch, in which is faſten'd on each Side the Seventh Rib.

At the lower Extremity of the *Sternum* there is a Cartilage of an Inch in Length, and pointed at the End, which is call'd the *Xiphoides*, or *Enſiformis*, from its Figure.

The *Mediaſtinum* is fixed to the interior Part of the *Sternum*.

At the ſuperior, anterior, and middle Part of the *Sternum*, there is a Cavity call'd the *Jugulum*.

The *Cartilago Xiphoides* is hollow below. In this Cavity the ſuperior and left Orifice of the Stomach is lodg'd.

At the ſuperior and middle Part of the *Sternum*, there is a Notch, and a Protuberancy on each Side of this Cavity, unto which the *Muſculus Sternohyoidæus* is faſten'd.

The *Sternothyroidæus* is fix'd to the interior and ſuperior Part of the *Sternum*.

The *Muſculus Triangularis* is tied with a broad Baſis to the inferior and interior Part of the *Sternum*. It riſes upwards, and is inſerted in the Cartilage of the Two ſuperior Ribs.

The *Pleura* does double it ſelf all along the middle Part of the *Sternum*.

The *Muſculus Pectoralis*, which pulls the Arm forward, is faſten'd to the middle and lateral Part of the *Sternum*.

The *Obliquus Internus Aſcendens* is faſten'd to the *Sternum* and the *Cartilago Xiphoides*.

The Two *Recti* are fix'd to each Side of the *Cartilago Xiphoides*, and upon the *Sternum*.

The *Maſtoidæus*, or the *Sternoclinomaſtoidæus*, is fix'd to the ſuperior and exterior Part of the *Sternum*.

Of the CLAVICULA.

The round Part of the *Clavicula* is that which is neareſt to the *Sternum*.

The broadeſt Part of the *Clavicula* is that which is neareſt unto the *Omoplata*.

The *Muſculus Subclavius* has its Origination at the interior and inferior Part of the *Clavicula*, near the *Acromium*, and its Inſertion at the ſuperior Part of the Firſt Rib, near the *Sternum*. It dilates the Breaſt.

At the Extremity of the round Part of the *Clavicula*, there is a ſuperficial Pit, into which the *Sternum* is inſerted.

The round and convex Part of the *Clavicula* is on the Outſide, but the round and concave Part is on the Inſide.

The concave Part of the *Clavicula*, where 'tis flat, is on the Outſide.

The convex Part of the flat End of the *Clavicula* is on the Inſide.

The flat End of the *Clavicula* is articulated with the *Acromium*; but its round End with the *Sternum*.

The Uſe of the *Clavicles* is to conjoin the *Omoplatæ* together with the Breaſt, and to prevent their falling upon the Ribs, and the Arms from moving too far forwards; as alſo the Luxation of the *Humerus* forwards.

The *Clavicles* are Two thin and ſpongious Bones, formed like a *Roman* S. and are ſituated at the ſuperior Part of the Breaſt.

The *Clavicles* are convex towards the *Sternum*, to give Paſſage to the Veſſels.

The *Clavicles* are concave towards the *Acromium*, for their more ſecure Articulation.

The *Clavicles* are articulated with the *Sternum* by an *Arthrodia*, for they have a manifeſt Motion.

The *Clavicles* are articulated with the *Omoplata* by a *Synchondroſis*.

The *Clavicles* are more incurvated in Men than in Women, which is the Reaſon why they have a fuller Neck.

At the anterior Part of the Extremity of the *Clavicula* there is a ſmall tendinous Ligament, which with its other End is faſten'd to the *Acromium*.

The Subclavian Veins are plac'd under the *Clavicles*.

The Lungs are tied to the *Clavicles* and to the ſuperior Ribs.

The Muſcle *Deltoides* takes its Origin at the Middle of the *Clavicula*.

The *Pectoralis* is faſten'd to the *Clavicula* near the *Sternum*.

The *Muſculus Subclavius* has its Riſe at the interior and inferior Part of the *Clavicula*, near the *Acromium*, and its Inſertion at the Firſt Rib, near the ſuperior Part of the *Sternum*. It does dilate the Breaſt.

The *Scalenius* is fix'd to the inferior Part of the *Clavicula*, near the *Acromium*.

The *Maſtoidæus* is fix'd to the Middle of the *Clavicula*.

Of

Of the OMOPLATÆ, *or* SHOULDER-BLADES.

The *Omoplatæ* are Two broad and thin Bones, ſituated One on each Side at the ſuperior and poſterior Part of the Breaſt.

They are plac'd upon the Ribs, from the Second to the Sixth true Rib.

The *Omoplata* are of a triangular Figure. Their interior Surface is concave, for their more convenient Application to the Ribs, which are convex.

The exterior Side of the *Omoplata* is very irregular, being concave in ſome Places, but convex in others.

The *Omoplata* has a long Prominency on the Back, which ſtretches athwart, and is call'd the Spine.

Above the Spine there is a great Cavity, which is call'd the *Cavitas Supraſpinata.*

Under the *Apophyſis* which is call'd the Spine there is a Cavity, which takes up all that lies under this Spine. This is call'd the *Cavitas Infraſpinata.*

The Edge or Brink of the ſuperior Part of the *Omoplata* is call'd the ſuperior Side.

The whole Length of the *Omoplata*, which runs from above downwards, is call'd the inferior Side. It is turn'd forwards.

That Side of the *Omoplata* which ſtretches from above downwards, from the ſuperior Side to its Point, and which turns towards the Spine of the Back, is call'd the *Baſis* of the *Omoplata.*

At the lowermoſt Part of the *Omoplata* there is an Angle, which is made by the Union of the *Baſis* and of the inferior Side of the *Omoplata*, and is call'd the inferior Angle.

The Angle which is made by the Conjunction of the ſuperior and of the inferior Side is call'd the ſuperior Angle.

The whole Extremity of that long *Apophyſis* which we have call'd the Spine, is call'd the *Acromium.*

At the ſuperior Part of the *Omoplata*, underneath the *Acromium*, there is a long *Apophyſis*, which is call'd the *Caracoides*, becauſe they ſay it is like the Beak of a Raven.

At the Extremity of the *Omoplata* there is a large round *Apophyſis*, which terminates in a flat Cavity. This *Apophyſis* is call'd the Neck of the *Omoplata*, into which the *Humerus* is articulated.

All the Edges of the *Omoplata* are diſtinguiſh'd into the interior, exterior, and middle *Lip.*

The interior Lips of the *Omoplata* are thoſe Edges that ſtand or look inwards.

The exterior Lips of the *Omoplata* are thoſe Edges that ſtand or look outwards.

The middle Lips of the *Omoplata* are thoſe Edges that are ſituated betwixt the exterior and interior Edges.

The *Omoplata* has ſeveral *Epiphyſes*, or Appendages: The *Firſt* is at the Extremity of the *Acromium*; the *Second* is at the *Apophyſis Coracoides*; the *Third* is at its Neck, which is conſpicuous in young Bodies.

The Articulation of the *Omoplata* with the *Humerus* is made by an *Arthrodia.*

The Uſe of the *Omoplata* is to give Origination and Inſertion to many Muſcles. It ſerves for the Articulation of the *Humerus*, to facilitate and enlarge the Motion of the Arms; for when we bend the Arm forwards, the *Omoplata* removes its Baſis from the Ribs, by drawing a little to the Ribs. If we ſtretch it backwards, it draws towards the Spine, by removing a little from the Ribs. When we lift the Arm upwards, its *Baſis* moves a good way from the Spine, and draws near the Side. When we let the Arm fall down, it riſes again, and reaſſumes its natural Poſition.

At the ſuperior Part of the *Omoplata* there is a large incurvated *Apophyſis*, which is call'd the *Acromium.* On its [illegible]rior and flat Side it has a ſmall ſuperficial Cavity, which receives the Head of the *Clavicula.*

All round the Cavity of the *Omoplata*, which receives the *Os Humeri*, there is a pliable Cartilage, which ſerves to augment or add to its Profundity, for the better Reception of the ſuperior Head of the *Os Humeri.*

The *Muſculus Supraſpinatus* does fill up all the Cavity which is above the Spine of the *Omoplata.* It paſſes under the *Acromium*, and encloſes the upper Part of the Head of the *Humerus.*

The *Muſculus Infraſpinatus* does cover all the exterior Part of the *Omoplata* which is under the Spine, and has its Inſertion at the ſuperior and poſterior Part of the *Humerus.*

rus. To the upper Part of the Edge of the whole ſuperior Angle of the *Omoplata* is faſten'd the *Muſculus Patientiæ*, by a large *Aponeuroſis*, which ſurrounds the whole Circuit of the Angle.

The *Muſculus Rhomboides* is faſten'd all along the upper Edge of the *Baſis* of the *Omoplata*, to wit, at the Edge from the Point of the inferior Angle, till above the Spine about an Inch, by means of a flat *Aponeuroſis*, which reaches to the *Muſculus Patientiæ*.

The *Serratus Major* is faſten'd to the whole Length of the interior Lip of the *Baſis* of the *Omoplata*. It begins at the Point of the inferior Angle, and runs on to the Point of the ſuperior Angle; ſo that it ſtands parallel to the *Rhomboides* and the *Levator Scapulæ*; theſe Two laſt being plac'd at the exterior Edge.

The *Serratus Minor* is tied to the ſmall End of the *Apophyſis Coracoides*.

The *Biceps* is faſten'd with one of its Tendons to the Extremity of the *Proceſſus Coracoides*.

The Second Tendon of the *Biceps* is fix'd upon the Edge of the *glenoide* Cavity of the *Omoplata*, to wit, in the Middle, under the great Production call'd the *Acromium*.

The *Coracoidæus* is fix'd to the very Extremity of the *Apophyſis Coracoides*.

The *Trapezius* is faſten'd all along to the *inferior Lip* of the Spine of the *Omoplata*, and covers one Half of this Spine at its full Length.

The *Deltoides* is fix'd to the *Acromium*, and ſtretches all along the ſuperior *Lip* of the *Spina* of the *Omoplata*. It covers one Half of this Spine.

The *Latiſſimus* is faſten'd to the ſmall Extremity of the inferior Angle of the *Omoplata*, upon its Convexity. It ſtretches along the Edge of the inferior Angle for the Space of about an Inch, underneath the *Rotundus Major*.

The *Rotundus Major* is faſten'd to the inferior Angle of the *Omoplata*, on its convex Part. It ſtreaches along the Edge of the inferior Side below, and runs parellel near and unto the *Latiſſimus*. It continues its Courſe to the Middle of the inferior Side of the *Omoplata*, from above of which it comes forth through a ſmall Chink, which is upon the Middle of the Edge of the Side.

All along the *Omoplata* there is moſt commonly a Furrow, that is parallel to the inferior Side, and which begins at the inferior Angle upon the convex Part. The *Rotundus Minor* is plac'd in this Furrow.

The *Subſcapularis* fills up the whole inferior Cavity of the *Omoplata*.

The *Extenſor Longus* of the fore Arm is fix'd to the inferior Side of the *Omoplata*, near its Neck.

At the Extremity of the *Acromium* there is a ſmall nervous Ligament, which with its other Extremity is faſten'd to the anterior Extremity of the *Omoplata*.

There is a tendinous Ligament alſo at the Point of the *Acromium*, at the *Apophyſis Coracoides*.

There is a ſmall Ligament at the *Baſis* of the *Proceſſus Coracoides*, which with its other End is tied to the Edge of the ſuperior Side of the *Omoplata*, near the *Apophyſis Coracoides*.

The *Subſcapularis* ſurrounds the Neck on the fore Part of the *Omoplata*.

One of the Tendons of the *Extenſor Longus* of the Arm is faſten'd to the inferior Side of the *Omoplata*, near its Neck.

Of the HUMERUS, *or* OS HUMERI.

The *Humerus* has its Poſition betwixt the Neck of the *Omoplata* and the Bone of the fore Arm.

At the ſuperior Part of the *Humerus* there is a large *Epiphyſis*, with a large round Head, which is inveſted with a very thick, pliable, and ſlippery Cartilage.

That Part of the *Humerus* which is immediately under its *Head* is call'd the *Neck*. This *Neck* is a very ſhort Appendage, or *Epiphyſis*.

Upon the anterior Part of the *Head* of the *Humerus* there is a Cleft or Trench, through which does paſs one of the Tendons of the *Biceps*.

About Three Inches below the *Head* of the *Humerus* there is a Hollowneſs, into which the Tendon of the *Deltoides* has its Inſertion.

The *Head* of the *Humerus* is articulated within the Cavity of the *Omoplata* by a peculiar Articulation, which varies very much from

from the reſt; for in all the others the *Head* of the Bone is receiv'd and rowl'd within an oſſeous Cavity: But here the Cavity of the *Omoplata* ſerves only for a Support or Prop to the *Head* of the *Humerus*, which is encloſed within a membranous *Capſula*, or Caſe: But it is obſervable, that the outward Side of this Head is not inveſted with this *Capſula*, which is a Membrane that has its Beginning at the Circumference of the Cavity of the *Omoplata*; which is the Reaſon that the Arm is capable of moving it ſelf every Way: Whereas though in the Articulation of the *Os Femoris* with the *Iſhium* there is a Motion alſo on all Sides, that Motion is nevertheleſs confined in ſome Meaſure, becauſe we cannot move it upward, backwards and forwards, and ſideways, beyond a certain Stretch, becauſe the Edges of its oſſeous Cavity will not permit its *Head* to go beyond it. But here it is quite otherwiſe, for we may carry our Arm quite upwards, ſtretch it out at its full Length, bring it quite forward upon the Breaſt, and backward quite upon the Back: But for fear this *Capſula* ſhould give way too far to the violent Motions of the Arm, and there ſhould follow a Diſlocation in the Joint, Nature has though fit to ſtrengthen this Caſe, or Receptacle, by a Second Tendinous Involucre, which owes its Origin to the Expanſion of all the Muſcles that ſerve for the Motion of the Arm.

When we lean fully and altogether upon our Hands, the Arm which ſuſtains the Body is puſh'd upwards with abundance of Force; which would be apt to tear the Receptacle, and to diſlocate the Arm, were it not for the Two Proceſſes of the *Omoplata* which ſtand in the Way, to wit, one call'd the *Acromium*, and the other the *Coracoides*; for when we puſh our Arm thus violently upwards, its Head ſlides in, and hides it ſelf within the Hollowneſs, which is form'd by theſe Two *Apophyſes*, with their Ligaments, which prevents a Luxation.

At the inferior, interior, and lateral Part of the *Humerus*, there is a Proceſs of about an Inch's Length, which ends in a Point. It is call'd the interior *Condylus*: From it all the *Flexores* of the *Carpus* have their Originations.

At the inferior, exterior, and lateral Part of the *Humerus* there is a rounded *Apophyſis*, which is call'd the *Exterior Condylus*, from which the *Extenſores* of the *Carpus* have their Origination.

At the inferior, poſterior, and middle Part of the *Cubit*, there is a pretty large Cavity betwixt the interior and exterior *Condylus*, into which, when the Arm ſtands quite ſtreight, does enter a large Proceſs, which is plac'd at the ſuperior Part of the *Os Cubiti*, and is call'd the *Olecranum*.

At the inferior, anterior, and middle Part of the *Humerus* there is a ſmall Pit, into which the ſuperior and anterior *Apophyſis* of the *Os Cubiti* is inſerted when we bend our Arm.

At the inferior, lateral, and exterior Part of the *Humerus*, there is a Prominency, or *Head*, which enters into the Cavity which is at the ſuperior Part of the *Radius*, upon which the *Radius* does turn like upon a Pivot.

The Body of the *Humerus* is very hollow in its interior Part, which is fill'd up with abundance of Marrow.

The Extremities of the *Humerus* are porous and ſpongious.

The *Humerus* is almoſt round, yet a little convex on the Outſide, and concave on the Inſide; very broad and unequal at the lower Part.

At the exterior Part of the *Humerus* there is a Kind of a Ridge or Spine, unto which the *Brachiæus Externus* is faſten'd.

The *Humerus* is articulated in its lowermoſt Part with the *Os Cubiti* by a *Ginglymus*.

The *Humerus* is articulated with the *Radius* by an *Arthrodia*.

At the lowermoſt Part of the *Humerus* there are Two *Sinus's*, divided by a Spine or Ridge. Theſe Sinuoſities do form a Pulley, as it were. Within the interior is received an *Apophyſis* of the *Os Cubiti*: In it the Arm performs its Motions of Extenſion and Flexion.

Into the exterior *Sinuoſity* is received the Extremity of the Head of the *Radius*.

On the anterior Part of the *Os Humeri* there is moſt commonly to be ſeen a Hole, through

through which passes a Vein, which enters within the Bone.

The *Musculus Anconæus* is fasten'd below the *Condylus Externus* of the *Humerus*, on the posterior Part, and betwixt the *Cubitus* and the *Radius*, to wit, on the posterior, lateral, and exterior Part of the *Cubitus*.

The *Deltoides* is plac'd almost at the Middle of the Arm, on the exterior Part. It raises the Arm.

The *Superspinatus* is inserted in the Neck of the Arm; which it draws upwards.

The *Rotundus Major* is fasten'd to the superior, lateral, and interior Part of the *Humerus*, underneath its *Head*; which it draws backwards.

The *Latissimus* is fasten'd with the *Rotundus Major* under the *Head* of the *Humerus*, to wit, on its lateral interior Part. It draws it backwards and downwards.

The *Pectoralis* has its Insertion in the superior and anterior Part of the *Humerus*, about Four Inches under its *Head*, betwixt the *Biceps* and the *Deltoides*, under the Sinuosity; which it pulls forwards.

The *Coracoidæus* is fix'd to the middle Part of the Arm, on the interior Part. It draws it inwards.

The *Infraspinatus* is plac'd at the superior and posterior Part of the *Humerus*. It draws it backwards.

The *Rotundus Minor* is fasten'd to the *Neck* of the *Humerus*. It draws it backwards.

The *Subscapularis* is fix'd to the Neck of the *Humerus*. It draws it towards the Sides.

The *Brachiæus Internus* is fasten'd above and on the fore Part of the *Humerus*, and to the superior, lateral, and interior Part of the *Cubitus* and the *Radius*.

The *Musculus Extensor Brevis* of the fore Arm is fix'd at the superior and posterior Part of the *Humerus*, to wit, to its *Neck*.

The *Brachiæus Externus* has its Rise at the middle and hind Part of the *Humerus*. This fleshy Mass stretches as far as to the *Olecranum*.

The *Anconæus* is plac'd upon the *Dorsum* of the exterior and inferior *Condylus* of the *Humerus*, and at the posterior, lateral, and exterior Part of the *Cubitus*, about Four Inches below the *Olecranum*.

The *Supinator Longus* is fix'd about Three or Four Inches above the exterior *Condylus* of the *Humerus*, and at the inferior and interior Part of the *Radius*.

The *Supinator Brevis* arises at the Arm, at the exterior *Condylus* of the *Humerus*, and is inserted at the superior and interior Part of the *Radius*.

The *Pronator Rotundus* is fix'd to the inferior Production of the Bone of the Arm.

The *Pronator Quadratus* has its Origination at the inferior, lateral, and exterior Part of the *Cubitus*.

The *Cubitæus Internus Flexor* of the *Carpus* is fasten'd to the interior *Condylus* of the *Humerus*.

The *Radiæus Internus* is fasten'd to the inferior and anterior Part of the interior *Condylus* of the *Humerus*.

The *Cubitæus Externus Extensor Carpi* is fix'd below to the exterior *Condylus* of the *Humerus*.

The *Radiæus Externus*, or *Extensor Longus Carpi*, is plac'd about an Inch above the exterior *Condylus* of the *Os Humeri*.

The *Radiæus Brevis Externus Extensor Carpi* is fasten'd to the exterior *Condylus* of the *Humerus*.

The *Sublimis Flexor Digitorum* is fix'd to the interior *Condylus* of the *Humerus*.

The *Extensor Digitorum* is fix'd on the lower Part of the exterior *Condylus* of the *Humerus*.

The *Palmaris* is fasten'd to the interior *Condylus* of the *Humerus*.

Of the OS CUBITI, *or the* CUBITUS.

The *Cubitus* has obtain'd its Denomination *a Cubando*, because we lean upon it. It is call'd also the *Ulna*, because the *Latins* used to measure by it. By the *Arabians* it is call'd the *Focile Majus*.

The superior Extremity of the *Os Cubiti* is much bigger than its inferior Part.

At the superior Part of the *Os Cubiti* there is a long and large *Apophysis*, which terminates like a Beak, and does enter into a Pit or Cavity that is behind the inferior Part of the *Humerus*, to prevent the Arm from falling too far outwards, beyond its streight Line,

Line, when it is extended at its full Length. This *Apophyſis* is call'd the *Olecranum*.

There are Two Cavities and One Prominency at the anterior and Superior Part of the *Olecranum*. The Two Cavities do receive Two Prominencies of the *Humerus*, and the Prominency is receiv'd into a Cavity of the ſame *Humerus*, and form that Sort of Articulation which is call'd a *Ginglymus*.

There is a Semilunar Cavity at the ſuperior, lateral, and exterior Part of the *Os Cubiti*, in which the *Radius* is articulated to make the *Pronation* and the *Supination*.

There is a ſhort and ſharp-pointed *Apophyſis* at the ſuperior and anterior Part of the *Cubitus*, which enters into a Cavity that is at the inferior, anterior, and middle Part of the *Humerus* when the Arm is bent. This *Apophyſis* prevents the fore Arm from falling quite upon the upper Arm, when we bend the Arm.

Below the Cavity in which the Brim of the *Radius* is articulated, there is a Prominency like a Spine, unto which the *Tendon* of the *Brachiæus Internus* is faſten'd.

All along the *Os Cubiti*, to wit, on that Side that turns towards the *Radius*, there is a long ſharp-edged *Apophyſis*, or Ridge. All along to this Spine is faſten'd a Ligament, which is tied alſo inwardly unto the whole Length of the *Radius*.

Unto the Extremity of the *Os Cubiti* are conjoin'd ſome Bones of the *Carpus*, by an *Arthrodia*, which have a very manifeſt Motion.

At the inferior Part of the *Os Cubiti* there is a pointed *Apophyſis*, call'd the *Styloides*.

At the inferior Part of the *Cubitus* there is a round Head, which is received into a ſmall Cavity, that is ſituated at the inferior Part of the *Radius*.

The Body of this Bone is very ſolid, and a little bent. It is triangular, with Three Surfaces.

This Bone has ſeveral Articulations: The Firſt is with the *Humerus*, by a *Ginglymus*; the Second with the Wriſt, by *Arthrodia*; the Third with the *Radius*, which is double, to wit, one on the upper, and the other on the lower Part, and either of them by *Arthrodia*. It has no other Motion beſides the *Pronation* and the *Supination*, or rather, (to ſpeak more properly) a circular Motion.

The *Cubitus* is articulated with the *Humerus* by *Ginglymus*, and not by an *Arthrodia*; that ſince it was to perform violent and ſtrong Motions: As for Inſtance; when we are to lift up ſome heavy Burthen, or to remove it, it might not turn or ſlip on one Side; which muſt of neceſſity have happen'd, if it had been articulated by *Arthrodia*: And beſides this, our Endeavours in that Kind would have proved fruitleſs.

But on the other Hand, it being neceſſary that the fore Arm ſhould be capable of turning on all Sides, upon many Occaſions, in order to follow the Motions of the Hand; Nature, to anſwer theſe Ends, has thought fit to articulate the *Radius* with the *Humerus* and the *Cubitus* by *Arthrodia*, which affords full Liberty to the fore Arm, in what Poſition ſoever it ſtands, to perform the Motions of *Pronation* and *Supination*.

The Tendon of the *Muſculus Longus* is tied to the *Olecranum* by Means of an *Aponeuroſis*, which is common to ſeveral others. It extends the Arm.

The *Extenſor Brevis Brachii* is fix'd to the *Olecranum*.

The Tendon of the *Brachiæus Externus* is tied with its *Aponeuroſis* to the *Olecranum*. It extends the Arm.

The *Anconæus* is plac'd at the ſuperior, lateral, and exterior Part of the *Cubitus*, about Four Inches below the *Olecranum*. It extends the Arm.

The *Flexor Profundus Digitorum* is faſten'd to the ſuperior and anterior Part of the *Os Cubiti*, and of the *Radius*, to wit, on that Part where they are conjoin'd with one another.

The *Extenſor Digiti Minimi* is faſten'd to the exterior Production of the *Humerus*.

The ſmall-pointed *Apophyſis* which is ſituated at the lower Part of the *Os Cubiti*, hinders the *Carpus* from being diſlocated inwards.

Of the OS RADII.

The *Radius* has obtained its Denomination from its Reſemblance to the Spoke of a Wheel. At the End of the ſuperior Extremity

mity of the *Radius* there is a flat ſuperficial Cavity, not unlike that of the *Omoplata*, which receives a Prominency of the *Humerus*.

The whole Circumference of the ſuperior Cavity of the *Radius* is very round and ſmooth, to facilitate its Motion in the Cavity, which is at the ſuperior and lateral Part of the *Cubitus*.

At an Inch's Diſtance below the ſuperior Cavity of the *Radius* there is a ſmall Prominency, which receives the Tendon of the *Flexor Biceps*.

All along the *Radius* there is a long ſharp-edged *Apophyſis* or Spine, to the whole Length of which is tied a broad membranous Ligament, which is faſten'd alſo all along to the ſharp-edged Ridge of the *Os Cubiti*. This Ligament ſerves to ſtrengthen the Articulation of the *Cubitus* with the *Radius*.

There are Two Cavities at the inferior Extremity of the *Radius*, which receive Two Bones of the *Carpus*.

There is a ſemilunar Cavity at the inferior and lateral Part of the *Radius*, which receives the inferior Head of the *Cubitus*.

There is pointed *Apophyſis*, call'd the *Proceſſus Styloides*, at the very lowermoſt Part of the *Radius*, which prevents the Diſlocation of the Wriſt outwards.

The *Muſculus Supinator Longus* is faſten'd to the inferior and interior Part of the *Radius*.

The *Supinator Brevis* is inſerted in the ſuperior and anterior Part of the *Radius*.

The *Pronator Rotundus* has its Inſertion to the middle, lateral, and external Part of the *Radius*.

The *Pronator Quadratus* has its Riſe at the inferior, lateral, and external Part of the *Radius*, in a Space of Three Inches in Length.

The *Flexor Profundus Digitorum* is faſten'd to the ſuperior and anterior Part of the *Radius*, and of the *Os Cubiti*, where they are conjoin'd with one another.

The *Flexor Pollicis* is faſten'd to the ſuperior and interior Part of the *Radius*.

The *Extenſor Longus Pollicis* is fix'd to the ſuperior and exterior Part of the *Radius*.

The *Extenſor Brevis Pollicis* is faſten'd to the ſuperior and exterior Part of the *Radius*, a little below the *Longus*.

The *Radius* is articulated with the *Humerus* by *Arthrodia*, with the *Os Cubiti* both above and below, and with the Wriſt by *Arthrodia*: So that, beſides the Motions of Extenſion and Flexion, which it has common with the *Cubitus*, it has alſo the *Pronation* and *Supinations*, by Means of its *Arthrodia* with the *Cubitus*.

From this Articulation and Motions we do reap this Advantage, That we can without Trouble bring the Hand to the Mouth, a Thing that is peculiar only to thoſe Animals that are provided with the Motion of *Pronation* and *Supination*.

There is one Thing more very obſervable in the Motion of the *Radius*, in Reference to the *Pronation* and *Supination*, to wit, That at the upper Part of the *Radius* there is a Prominency, which, like an Axel-Tree, does rowl within the Cavity of the *Cubitus*: Whereas, on the contrary, the *Radius* has a Cavity below, and the *Cubitus* has a Prominency: And notwithſtanding this, the *Radius* turns and riſes above the *Apophyſis* of the *Cubitus*, and the *Cubitus* is unmoveable when the *Radius* does turn.

Of the Bones of the CARPUS.

The *Carpus*, or Wriſt, conſiſts of Eight Pieces, diſpoſed in Two Rows, to wit, Four in the Second Row, that which is neareſt to the Fingers; Three in the Firſt, that which is next to the *Cubitus*; and One without the Row, plac'd upon another Bone directly oppoſite to the Little Finger, ſo as to riſe above it, and to ſtand in the ſame Poſition with a Prominency which is form'd by the Firſt Bone of the Firſt Row.

And here it is to be obſerv'd, that we always begin to account theſe Bones from the Little Finger; ſo that, for Inſtance, when we ſay the *Firſt Bone* of the *Firſt* Row, we underſtand that which is ſituated under the Little Finger; and in the ſame Manner with the reſt.

The Eight Bones of the *Carpus* have their Poſition betwixt the *Radius* and the *Metacarpus*.

The Three Bones of the Firſt Row are join'd with the *Radius* and the *Cubitus* by *Arthrodia*.

The Four Bones of the Second Row, that which is neareſt to the Fingers, is articulated by a *Synarthrodial Arthrodia*, as the Authors call it; but it ſeems to come nearer to the Nature of a *Ginglymus*.

The Bones of the *Carpus* are articulated with one another, ſome by an *Arthrodia*, but almoſt all of them by a *Ginglymus*, being ſtrengthen'd by very ſtrong Ligaments, which keep them very cloſe together.

The Eight Bones of the *Carpus* are plac'd in ſuch a Manner, as to make a Convexity on the Outſide, and a Concavity on the Inſide, to facilitate the Action of the Hand, which is to take hold, and to keep a Thing we have taken before.

The Figure of the Bones of the *Carpus* is very unequal and rugged: Some ſay it reſembles unto the Kernel of a Pine-Apple.

Nature has thought fit to make the *Carpus* a Compoſition of ſeveral Bones, which are articulated with one another by a very looſe Connexion, to enable them to give Way on all Sides.

Above the Firſt Bone of the Firſt Row is ſituated a Bone without the Rank or Row, unto which is faſten'd a Ligament, call'd the *Annular*, which is tied alſo to a long *Apophyſis*, which is plac'd above the laſt Bone of the Second Row. This Ligament makes a Kind of an Arch, underneath which the Tendons of the *Flexores Digitorum* do paſs.

The Firſt Bone of the Second Row, and the Fourth, have each a pretty large *Apophyſis*. Unto theſe Two Proceſſes the annular Ligament is tied, which makes a Kind of a Bridge, underneath which the Tendons of the *Flexores Digitorum* do paſs.

The *Cubitæus Internus Flexor Carpi*, is faſten'd to the Bone of the *Carpus* which is plac'd above the others, without the Row, on the Side of the Little Finger.

The *Radiæus Internus Flexor Carpi*, is faſten'd to the Bone of the *Carpus* which ſupports the Firſt *Phalanx* of the Thumb.

The *Femur*, or *Abductor Pollicis*, which makes it move from the other Fingers, has its Riſe at the Bone of the *Carpus* that ſupports the Thumb. This Muſcle does form the *Mons Veneris*.

Of the Bones of the METACARPUS.

The *Metacarpus* conſiſts of Four Bones, which are the biggeſt belonging to the *Hand*, properly ſo call'd.

The Bones of the *Metacarpus* reſt one upon another at their Extremities, which adds to their Strength; but ſtand at a Diſtance from one another in their Middle, for the convenient Poſition of the interoſſeous Muſcles.

They are convex on the Outſide, and concave in their interior Part.

The Bones of the *Metacarpus* are provided on their ſuperior Part with ſeveral ſmall *Heads* and Cavities, which are articulated by *Ginglymus* with the Second Row of the Bones of the *Carpus*, which makes them have a very obſcure Motion.

At the inferior Part of the Bones of the *Metacarpus* there are round *Heads*, which are articulated by *Arthrodia* with the Firſt *Phalanx* of the Fingers; which is the Reaſon that this *Phalanx* has a very manifeſt Motion.

The *Antitenar Pollicis* is faſten'd at the interior Part of the *Os Metacarpi*, which ſupports the Finger call'd the *Index*.

The *Hypotenar* is faſten'd to the Bone of the *Carpus*, which is plac'd above the reſt on the Side of the ſmall Finger, and its Tendon is lodg'd on the exterior Part all along the Three *Phalanxes* of the Fingers.

All along the Inſide of the Bones of the *Phalaxes* of the Fingers, there is a Gutter, through which the Tendons of the *Flexores* have their Paſſage.

At the Root of the Bones of the *Metacarpus* there are ſmall Prominencies on each Side, unto which the interoſſeous Muſcles are faſten'd, to wit, the *Interni* to the interior Prominencies, and the *Externi* to the exterior Protuberancies.

The *Cubitæus Externus Extenſor Carpi* is faſten'd to the inferior Prominency of the Bone of the *Metacarpus*, which ſuſtains the Little Finger.

The *Radiæus Longus Externus Extenſor Carpi*, is faſten'd to the Bone of the *Metacarpus* which ſuſtains the Finger call'd the *Index*.

The *Radiæus Brevis Externus Extenſor Carpi*, is faſten'd to the inferior and poſterior Part of the Two Bones of the *Metacarpus*, one of which ſupports the *Inde* , and the other the Middle Finger.

The Six *Interoſſei* are plac'd betwixt the Bones of the *Metacarpus*, to wit, Three on the exterior, and Three on the inner Side. The *Externi* are faſten'd to the exterior lateral Part of the Firſt *Phalanxes*.

Of the Bones of the FINGERS.

The Fingers are Five in Number, which conſiſt of Fifteen Bones, to wit, Three in each Finger, each of which is call'd a *Phalanx*, or a Rank. The Fingers are unequal in their Size, the middlemoſt being the biggeſt of all the reſt.

All along the *Phalanxes* of the Fingers there is a Kind of a Gutter on the interior Part, at the whole Length of which is plac'd the Tendon of the *Flexores Digitorum*.

All along the Sides of the Fingers there is a Ridge, unto which the Ligament that encloſes the Tendons of the *Flexores Digitorum* is faſten'd.

At the inferior Part of each *Phalanx* of the Fingers there is a Cavity, into which the *Head* of each of the Bones of the *Metacarpus* is articulated by *Arthrodia*; which is the Reaſon why in that Part the Finger is moveable on all Sides.

The Second and Third *Phalanxes* are articulated both above and below by *Ginglymus*: Whence it is, that they have no other Motions excepting thoſe of Extenſion and Flexion.

The Articulation of the *Baſis* of the Thumb has more of a *Ginglymus* than of an *Arthrodia*, becauſe its Head is not exactly round, as the *Phalanx* of the other Fingers is: Whence it is, that when the other Fingers are bent within the Hand, in order to take Hold of any Thing, the Thumb has no other Share in this Action than to keep them cloſe together, and to ſtrengthen their Preſſure, to prevent their letting go their Hold: And this Function may be perform'd by a *Ginglymus*.

The Fingers do conſiſt of ſeveral Pieces, to make them pliable, and adapt them for different Motions.

Each of the Four Tendons of the *Flexor Sublimis Digitorum* is inſerted in the Second *Phalanx* of the Fingers, and at the Firſt in its Paſſage.

Each of the Four Tendons of the *Flexor Profundus Digitorum*, has its Inſertion at the Middle of the laſt *Phalanx* of the Fingers.

Each of the Four Tendons of the *Extenſor Magnus Digitorum*, has its Inſertion in each of the laſt *Phalanxes* of the Fingers.

The Four *Lumbricales* are faſten'd to the interior lateral Part of the Firſt *Phalanxes* of the Fingers.

The Three *Interoſſei Externi* are faſten'd to the lateral exterior Part of the Firſt *Phalanxes*.

The *Flexor Pollicis* is inſerted under the laſt *Phalanx*.

The *Extenſor Longus Pollicis* is fix'd upon the Second *Phalanx*.

The *Extenſor Brevis Pollicis* is inſerted at the great *Phalanx* of the Thumb; that which ſuſtains the other *Phalanxes*.

The *Tenar Pollicis* has its Inſertion at the lateral Part of the Second *Phalanx* of the Thumb.

The *Antitenar Pollicis* has its Inſertion on the lateral Part, within the Firſt and Second *Phalanx* of the Thumb.

The *Indicator* is inſerted in the lateral and exterior Part of the Second *Phalanx* of the *Index*.

The *Adductor* of the *Index* is faſten'd to the anterior and interior Part of the Firſt *Phalanx* of the Thumb, and within the Firſt Bone of the *Index*.

The *Extenſor Digiti Minimi* has its Inſertion at the lateral and exterior Part of the Second *Phalanx* of the Little Finger

At the Extremity of the laſt *Phalanx* of each Finger, there is a ſmall Protuberancy made in Form of a Croſs, unto which the Nails are faſten'd.

Of the OSSA ILIUM.

The *Oſſa Innominata* do form the whole Cavity of the *Hypogaſtrium*, which is call'd the *Pelvis*, or the Baſon.

The

The *Ossa Innominata* have on their interior and posterior Part, to wit, towards the Extremity of the Side of the *Os Ilium*, a deep Furrow interspersed with *Apophyses*. These Pits do receive and are received in the superior and lateral Part of the *Os Sacrum*, by what is call'd a *Ginglymus*.

In young Children the *Os Innominatum* is divided into Three Bones, but in adult Persons it makes but one single Bone. These Bones are call'd the *Os Ilium*, *Ishium*, and of the *Pubes*.

The *Os Ilium*, which is articulated with the *Os Sacrum* by a *Ginglymus*, does form the superior and lateral Part of the *Pelvis*. It is a little hollow on its exterior Part, which serves for a Receptacle to the Three *Musculi Glutæi*, to wit, the *Major*, *Minor*, and *Minimus*.

The *Os Ilium* is incircled on its superior Part with a Brow or Brim, call'd the *Lip*. This Brow is edged with a Cartilage, unto which almost all the Muscles of the *Abdomen* are fasten'd.

The *Os Ilium* has a Chink at its inferior Part, through which passes the *Tendon* of the *Obturatores*, and is subservient towards the forming of the Cavity of the *Ishium*.

There is a strong and large Ligament tied to the posterior Extremity of the Circumference of the *Os Ilium*, all along the Side of the *Os Sacrum* and the *Coccyx* above, and to the Protuberancy of the *Ishium*.

The superior Ligament of the Womb, which bears a Resemblance unto the Wing of a Bat, ties the Womb to the *Ossa Ilium*.

The *Psoas* does pass upon the lower Part of the interior Surfaces of the *Ossa Ilium*.

The *Abductor Longus* is fasten'd to the Point of the anterior and superior Spine of the *Os Ilium*.

The *Membranosus* is fasten'd to the superior and anterior Spine of the *Ilium*.

The *Triangularis*, or *Quadrangularis Flexor Lamborum*, is fasten'd to the exterior *Lip* of the posterior Part of the *Ossa Ilium*.

The *Iliacus* is fasten'd round about the interior *Lip* of the *Os Ilium*, and fills up the whole interior Cavity of the *Os Ilium*.

The *Glutæus Major* is fix'd round the exterior Lip of the *Os Ilium*.

The *Glutæus Medius* does fill up the exterior Cavity of the *Os Ilium*, and occupies the anterior Part.

The *Glutæus Minor* does fill up the exterior Cavity of the *Os Ilium*, which is at the posterior Part.

Above the *Capsula*, or Cavity, which is situated at the anterior Part, in which the *Head* of the *Os Femoris* is articulated, there is an *Apophysis*, or Prominency, which is call'd the anterior and inferior Spine of the *Os Ilium*, unto which the *Extensor Rectus Tibiæ* is fasten'd.

The *Obliquus Externus Descendens* is fix'd to the Spine or Ridge of the *Os Ilium*.

The *Obliquus Internus Ascendens* is fasten'd to the interior Spine or Ridge of the *Os Ilium*.

The *Musculus Transversalis* is fix'd to the interior Edge of the *Os Ilium*.

Of the ISHIUM.

The *Os Ishium* occupies the inferior and posterior Part of the *Ossa Innominata*. The Bone forms the greatest Part of the *Foramen Ovale*, and a Part of that Cavity in which the *Os Femoris* is articulated.

Upon the Protuberancy of the *Ishium* is fasten'd a large and strong Ligament, which rising above the *Coccyx*, all along the Side of the *Os Sacrum*, is fasten'd to the posterior Extremity of the Circumference of the *Os Ilium*.

A little above the Protuberancy of the *Os Ishium* there is a pointed *Apophysis*, which is call'd the Spine of the *Os Ishium*.

The Second of the *Quadrigemini* is fasten'd to the Spine of the *Ishium*.

The Third of the Muscles call'd the *Quadrigemini*, is fasten'd to the Protuberancy of the *Os Ishium*.

The longest Head of the *Biceps* arises at the Protuberancy of the *Ishium*, together with the *Deminervosus*.

The Protuberancy of the *Ishium* is that large round Prominency upon which we sit. Its Position is behind the *Foramen Ovale*.

The *Erectores* are fasten'd to the interior Part of the Protuberancy of the *Ishium*.

The *Musculus Quadratus Abductor* of the Thigh, is fasten'd to the lateral exterior Part of the Protuberancy of the *Os Ishium*.

The *Acceleratores* are fix'd to the Inside of the Protuberancy of the *Os Ischium.*

Betwixt the *Spine* of the *Os Ischium* and its Protuberancy there is a large Chink or Furrow, through which passes the *Obturator Internus.*

The *Erectores* of the *Clitoris* are fasten'd to the Protuberancy of the *Os Ischium.*

The *Obturator Externus* is fasten'd to the Outside, round the *Foramen* of the *Os Pubis.*

The *Seminervosus Flexor Tibiæ* is fix'd to the Protuberancy of the *Os Ischium.*

The *Levatores Ani* are fasten'd to its interior lateral Part.

The *Semimembranosus* is fix'd to the Protuberancy of the *Os Ischium*, at the same Place with the *Seminervosus.* It is one of the *Flexores Tibiæ.*

Of the OS PUBIS.

The *Os Pubis* is so call'd, because thereabouts we see the First Marks of Puberty appear.

The *Os Pubis* does form the superior Part of the *Foramen Ovale*, and one Part of the Cavity or Receptacle of the *Os Ischium.*

Underneath the *Os Pubis*, to wit, at the superior Part of the *Foramen Ovale*, and at the inferior Side of the Receptacle, there is a Furrow or Gutter, through which the internal Iliaque Arteries and Veins take their Passage.

Upon the *Os Pubis*, to wit, betwixt the Cavity and a large Protuberancy, which makes the superior and anterior Part of the *Os Pubis*, there is a Furrow or Notch, through which the external Iliaque Veins and Arteries, as also the Spermatick Vessels, do pass.

The Manly Yard is situated at the Root of the *Os Pubis.*

The Neck of the Womb is, by Means of the *Peritonæum*, fasten'd before to the *Ossa Pubis*, and behind to the *Os Sacrum.*

The inferior Ligament of the Womb is fasten'd to the *Os Ilium*, and repasses over the *Os Pubis.*

The *Obliquus Externus Descendens* is fasten'd to the *Os Pubis*, as well as the *Obliquus Internus Ascendens.*

The *Musculus Rectus Abdominis* is fix'd to the Spine of the *Os Pubis.*

The *Pyramidales* are fasten'd to the exterior and superior Part of the *Os Pubis.*

The *Erectores* of the *Clitoris* are fasten'd to that Part where the *Ossa Pubis* are conjoin'd together.

The *Pectinæus*, or *Lividus*, is fasten'd upon the superior Part of the *Os Pubis*, near the Articulation.

The *Triceps* has its first *Head* fix'd to the superior Part of the *Os Pubis*, near the *Symphysis.*

The Second *Head* of the *Triceps* is lodged towards the middle Part of the *Os Pubis*, near its Connexion.

The Third *Head* of the *Triceps* is plac'd at the inferior Part of the *Os Pubis.*

At the lower Part of the great Cavity, in which the *Os Femoris* is articulated, there is a great oval *Foramen* or Hole. The *Obturator Internus* is fix'd round the interior Circumference of this Hole.

All round the Edge or Brink of the same oval Hole of the *Os Pubis* there is a Membrane, which separates the *Obturator Internus* from the *Externus.*

The *Flexor Posticus* is fasten'd to the anterior and inferior Part of the *Os Pubis*, in that Part where it is united with the *Os Ischium*, in young Bodies.

The *Musculus Transversalis Abdominis* is fasten'd to the *Os Pubis.*

CHAP.

CHAP. IV.

Of the Bones of the FOOT.

Of the OS FEMORIS.

AT the ſuperior Part of the *Femur* there is a large round *Head*, which enters into the great Receptacle or Cavity of the *Os Iſhium*. This Articulation forms the moſt conſiderable *Arthrodia* or *Enarthroſis* that is obſervable in the whole Body.

At the very Extremity of the *Head* of the *Femur* there is an unequal Cavity, which is moſt commonly perforated with many ſmall Holes. Into this Pit or Cavity is inſerted that round Ligament which ties the Head of the *Femur* within the Cavity or *Capſula*, in order to prevent its Diſlocation or Luxation out of the Cavity. This Connexion is ſomewhat looſe.

All round about the inferior Part of the large *Head* of the *Femur* there is a rugged Circle, round which is faſten'd a fine Coverture, which is tied alſo round the exterior Edge of the Cavity. Within this Coverture is encloſed an oleous Liquor, which keeps the Joint moiſt and ſouple.

All round the inferior Part of the large Head of the *Femur* there are ſome Inequalities, unto which the *Perioſtæum* is faſten'd, and terminates upon them, without covering the Head of this Bone, no more than it does any of the bony Heads in the Joints: For the *Perioſtæum* being of a very exquiſite Senſe, the Colliſion of the Bones in the Articulations muſt have occaſion'd moſt violent Pains, if this Membrane had been extended over them.

Above the Head of the *Femur* there is a round, long, and oblique *Apophyſis*, which is call'd the Neck. By its Obliquity, the Head of the *Femur* makes a conſiderable Angle with the Body of the Bone, in order to its Articulation with the *Os Ilium*, which does not ſtand exactly at the Side. By this Piece of Mechaniſm, the Interſtice of the *Thighs* is made much larger, for the greater Conveniency of the Muſcles that are lodged there, and to prevent their rubbing one againſt the other, which would prove detrimental to, and impair the Genital Parts.

At the ſuperior Part of the *Femur*, at its exterior Part, and a little below its great Head, there is a large *Apophyſis*, which is call'd the great *Trochanter*.

At the Root of the great *Trochanter* there is a pretty deep Cavity, into which the *Muſculi Quadrigemini* and the *Obturatores* have their Inſertions.

In the Cavity which is at the Root of the great *Trochanter*, there are ſome Holes, which give Paſſage to the Veſſels.

The inferior Part of the *Os Femoris* grows flat, into a large *Epiphyſis*, which has Two *Condyli*.

At the inferior and interior Side of the *Os Femoris* there is a large *Apophyſis*, which is call'd the interior *Condylus*.

At the inferior and exterior Side of the *Os Femoris* there is a large *Apophyſis*, call'd the exterior *Condylus*.

At the inferior Part of the *Femur* there is a great Cavity, ſituated betwixt the interior and exterior *Condylus*. This Cavity does receive a ſmall Prominency, which is ſeated at the upper Part of the *Tibia*.

Within the great Cavity, which is ſituated betwixt the Two *Condyli*, at the inferior Part of the *Os Femoris*, there is a great Lump of Fat.

In the interior Part of the exterior *Condylus*, which is plac'd at the lower Part of the *Femur*, there is a ſmall Cavity, which receives a nervous Ligament, which going on obliquely, is tied to the upper Part of the *Tibia*, at the anterior Part of the Root of a large Protuberancy.

In

In the interior Part of the interior *Condylus*, which is ſeated at the lower Part of the *Os Femoris*, there is a ſmall Cavity, into which is faſten'd a nervous Ligament, which with its other Extremity is tied obliquely to the ſuperior Part of the *Tibia*, to wit, at the anterior Part of the Root of a large Protuberancy, which is ſeated at the upper Part of the *Tibia*. This Ligament makes, with the other juſt now mention'd Ligament, a Croſs like a *St. Andrew*'s-Croſs.

At the lateral and exterior Part of the exterior *Condylus*, which is ſituated at the inferior Part of the *Os Femoris*, there is a Hollowneſs, within which is faſten'd a large Ligament, which with its other Extremity is tied to the ſuperior, lateral, and external Part of the *Perone*.

Upon the exterior Side of the internal *Condylus*, which is ſeated at the lower Part of the *Femur*, there is a very ſuperficial Hollowneſs, into which a flat Ligament is faſten'd, which with its other End is tied to the ſuperior Part of the *Tibia*, within a ſmall Pit.

At the inferior and anterior Part of the *Femur* there are Two Prominencies and One Cavity: The Cavity does receive the Prominency of the *Rotula*, and each of theſe Prominencies does enter into each of the Cavities of the *Rotula*, which forms that Articulation which is call'd a *Ginglymus*.

All along the poſterior Part of the *Os Femoris* there is a large rugged Line or Ridge, which divaricates into Two Branches, which continue their Courſe to each of the inferior *Condyli*. To the whole Length of this Ridge the Muſcles are faſten'd.

Below the *Neck* which ſupports the great *Head* of the *Femur*, at the interior Part, there is an *Apophyſis*, ſhap'd not unlike a Teat, call'd the leſſer *Trochanter*.

The great Head of the *Femur* is an *Epiphyſis*, which is ſcarce to be ſeparated from the other Part of the Bone. It is like all the other *Heads* of the Bones, covered with a ſmooth Cartilage, which does facilitate its Motion.

The *Pſoas*, or *Flexor Femoris*, is fix'd to the Leſſer *Trochanter* by a round Tendon.

The *Iliacus* is faſten'd to the ſuperior Part of the Leſſer *Trochanter*, and intermixes its Tendon with that of the *Pſoas*.

The *Pectinæus*, or *Lividus*, is faſten'd to the ſuperior and interior Part of the *Femur*, a little under its Neck, on the Side of the Leſſer *Trochanter*, by a large Tendon.

The Tendon of the *Glutæus Major* is inſerted into an *Apophyſis*, which is ſituated Three or Four Inches below the Great *Trochanter*, at its poſterior Part.

The *Glutæus Medius* is faſten'd to the ſuperior and external Part of the Great *Trochanter*, which it encloſes.

The *Glutæus Minor* has its Inſertion at the Beginning of the ſuperior Part of the Cavity, which is ſeated at the Root of the Great *Trochanter*.

The *Triceps* is inſerted with its Firſt *Head* in the Middle of the poſterior Line or Ridge of the *Os Femoris*.

The Second *Head* of the *Triceps* has its Inſertion towards the ſuperior Part of the ſharp-edged poſterior Line or Ridge of the *Femur*, above the preceding.

The Third *Head* of the *Triceps* is inſerted in the inferior, lateral, and interior Part of the *Femur*. This Muſcle does move the Thighs one towards another.

At the Root of the Great *Trochanter* there is a Cavity, which is ſituated betwixt the Great *Trochanter* and the Great *Head* of the *Femur*, into which is inſerted the Tendon of the *Muſculus Pyramidalis*, the Two *Gemini*, the *Obturator Internus*, and the *Obturator Externus*.

The *Muſculus Quadratus Abductor* of the Thigh is faſten'd to the lateral exterior Part of the great *Trochanter*.

The Second *Head* of the *Biceps* is faſten'd to that ſharp-edged Line or Ridge, which is plac'd at the middle and poſterior Part of the *Femur*.

The *Vaſtus Externus Extenſor Tibiæ* is faſten'd to the Root of the Great *Trochanter*.

The *Vaſtus Internus Extenſor* is faſten'd to the Root of the Leſſer *Trochanter*.

The *Cruræus Extenſor Tibiæ* is fix'd betwixt the Two *Trochanters*, on the anterior Part.

The *Poplitæus Abductor Tibiæ* is faſten'd to the inferior Part of the exterior *Condylus* of the *Os Femoris*, and is plac'd obliquely upon the Two Bones of the Leg. It has its Inſertion

tion at the ſuperior and interior Part of the *Tibia*.

The Two Heads of the *Gemini Extenſores* are faſten'd to the inferior Part of the *Femur*, to wit, behind the Two *Condyli*.

The *Plantaris Extenſor Pedis* is faſten'd to the exterior *Condylus* of the *Os Femoris*.

The Two Tendons of the *Tibialis Poſticus Extenſor Pedis*, do paſs through the Furrow or Chink which is ſeated at the lower Part of the *Malleolus Externus*.

The Body of the *Femur* is round, convex on its anterior Part, and concave on its poſterior. It is hollow within like the *Humerus*, and contains Abundance of Marrow.

The *Os Femoris* is articulated on its ſuperior Part with the *Oſſa Innominata*, by a very large Head, or a very remarkable *Arthrodia*; at its inferior Extremity with the *Tibia*, by a *Ginglymus*. The *Tibia* moves below the *Femur* to the Right and to the Left, though they are are articulated together by a *Ginglymus*, which is no leſs firm and compact than what is obſerved in other Articulations. But the Difference lies here, That in the other Articulations of the *Ginglymus*, the Protuberancies and Cavities are much more conſiderable, and the Brows or Edges raiſed higher, by which Means they retain theſe Brows within the proper Limits of a ſimple Motion; whereas in this, the Prominencies are more flat, and conſequently incapable of reſiſting the rowling Motion of the Bones, which thus may be made in very different Ways.

Of the ROTULA.

The *Rotula* is a round and flat Bone, which is pointed at its lower Part.

The *Rotula* has its Poſition above the Articulation of the *Femur*, within a Cavity, that is ſeated before, betwixt the Two interior *Apophyſes* of the *Tibia*.

Under the *Rotula* there is a Prominency, which ſtretches from above downwards, which is articulated within a Cavity at the inferior and anterior Part of the *Femur*.

On each Side of the *Apophyſis* which goes from above downwards under the *Rotula*, there is a ſuperficial Cavity within an *Apophyſis*, which is plac'd at the inferior Part of the *Femur*.

At the inferior Part of the *Rotula* there is a Point, upon which is faſten'd a large, broad, and nervous Ligament, which with its other Extremity is tied to an *Apophyſis* that is ſituated upon the *Tibia*, about Three Inches below the Knee, which prevents its riſing higher than it ought to do in the Extenſion of the Thigh, when the *Extenſores*, unto which it adheres very cloſe, perform their Function.

The main Part of the Motion of the *Rotula* is made upon the inferior Extremity of the *Femur*, and its Articulation approaches very near to a *Ginglymus*, for it has Two Cavities, and One Prominency in the Middle, which are inveſted with Cartilages.

The *Rotula* does not fill up or occupy above the Third Part of the anterior Cavity of the *Os Femoris*. It is ſeparated from the *Tibia*. It riſes upwards in the Extenſion above the Articulation; and the more the *Muſculi Extenſores* perform their Functions, the more it riſes upwards, becauſe they do ſtick very cloſe to it.

'Tis obſervable, That the Brutes have a *Rotula* upon the Knee, and nevertheleſs their Knees are pliable; which ſhews plainly, that the *Rotula* does not add any Thing to the ſtrengthening of the Articulation of the *Femur* with the *Tibia*, and that it does not hinder the Flexion of the Leg forward, as it has been generally believed that it does.

The *Rotula* does ſerve inſtead of a Pulley to the *Muſculi Extenſores Femoris*, and prevents their rubbing againſt the Bones when they move upon it. They add alſo to their Strength.

The *Muſculus Rectus*, the *Vaſtus Externus*, the *Vaſtus Internus*, the *Cruræus Extenſor Tibiæ*, are conjoin'd together by a very large *Aponeuroſis*, which paſſes over the *Routla*, and covers it like a Cap.

Of the TIBIA.

The *Tibia* has its Poſition at the interior and anterior Part of the Leg.

At the ſuperior Extremity of the *Tibia* there is a large *Head*, which is an *Epiphyſis*; in the Middle of which there is a ſmall rugged *Apophyſis*, which is received into the Interſtice of the Prominencies of the *Femur*.

Upon

Upon the upper Part of the *Tibia* there are Two Cavities, to wit, One on each Side of an *Apophyſis*, which is plac'd at the Middle of this Bone, which do receive the Two Prominencies of the *Femur*.

At the Root of the rugged *Apophyſis*, which is in the Middle of the *Head* of the *Femur*, at the anterior Part, Two nervous Ligaments are faſten'd on each Side, which with their other Extremities are tied within the Pulley or Cavity that is at the lower Part of the *Femur*, (after having croſs'd one another in Form of a Croſs) to wit, one on each of the inferior Sides of the Two large *Apophyſes*.

The anterior and ſuperior Edges or Brows of the Head of the *Tibia*, are edged with Two large Cartilages, to wit, One on each anterior Side. 'Tis upon theſe moveable Cartilages that the Two *Apophyſes* of the *Femur* do rowl when we are walking.

The poſterior and ſuperior Brows or Edges of the *Head* of the *Tibia* are edged with Two thick moveable Cartilages, to wit, One on each poſterior Side. It is upon theſe Two Cartilages that the Two *Apophyſes* of the *Femur* do turn themſelves when we are walking.

At the exterior Side of the *Head* of the *Femur*, a little backwards, there is a ſmall round Head, which is incruſtated with a Cartilage, and does enter into the lateral, ſuperior, and interior Part of the *Perone*.

At the lateral, external, and ſuperior Part of the *Tibia*, to wit, about Three Inches under its Head, there is a Protuberancy, unto which are fix'd the *Extenſores* of the Leg.

All along the anterior Part of the *Tibia* there is a Line or Ridge, which is ſomewhat ſharp-edged; unto the whole Length of which is faſten'd a large membranous Ligament, which with its other Extremity is tied all along to the *Perone*. This is call'd the exterior Ridge or Line.

At the inferior, interior, and lateral Part of the *Tibia*, there is a large *Apophyſis*, which does form the interior *Malleolus*, ſtrengthens the Articulation of the *Tarſus*, and hinders its being diſlocated on the Sides.

At the inferior, lateral, and exterior Part of the *Tibia*, there is a Kind of a Furrow like a Gutter, into which is inſerted the interior Side of the inferior End of the *Perone*. This Cavity or *Sinus* is not covered with any Cartilage.

At the very undermoſt Part of the *Tibia* there is a large Cavity, into which the ſuperior Part of the *Tarſus*, that which is call'd the *Aſtralagus*, is articulated by a very obſcure *Ginglymus*.

The middle Part of the *Tibia* has nothing that is remarkable belonging to it, excepting that it is triangular.

At the interior Side of the large *Head*, or the ſuperior *Epiphyſis* of the *Tibia*, there is a Pit, which receives a large Ligament, which with its other End is tied to the Side of the interior *Apophyſis* of the *Femur*.

At the exterior Side of the great *Head*, or the ſuperior *Epiphyſis* of the *Tibia*, there is a ſuperficial and unequal Cavity, which receives a large Ligament, which with its other Extremity is faſten'd to the exterior Side of the exterior *Apophyſis* of the *Femur*.

The annular Ligament ariſes from the Appendage of the *Tibia*, which does form the interior *Malleolus*, and the *Perone*.

All along the interior Part of the *Tibia* there is a ſharp-edged Ridge, which is call'd the Spine, or the Firſt Line of the *Tibia*.

All along the interior Part of the *Tibia* there is an obtuſe Line or Ridge, which is call'd the Interior.

The Ligament that does tie the *Tibia* to the *Calcaneum* is faſten'd to the inferior and interior Appendage of the *Tibia*.

Theſe beforeſaid Lines or Ridges make Three flat Surfaces, the interior of which does occupy the anterior Part, which is ſomewhat convex, and not covered with Fleſh.

The Second Surface of the *Tibia* does occupy the exterior Side, which is deſigned for the anterior Muſcles, which are faſten'd to the *Tibia*.

The Third Surface is on its poſterior Part, and deſign'd for the poſterior Muſcles.

At the poſterior Part of the *Tibia*, towards its ſuperior Part, there is moſt commonly to be ſeen a very remarkable *Foramen*, which penetrates into the Subſtance of the Bone, through which a Vein takes its Paſſage.

Juſt at the Extremity of the *Malleolus Internus* there is a pretty deep Gutter, through which paſſes the Tendon of the *Muſculus Peronæus*

ronæus Anticus, and with its other End is faſten'd to the long Point of the *Metataſus*, (on the lower Part) which ſuſtains the Great Toe.

The *Seminervoſus* is faſten'd to the ſuperior and interior Part of the *Tibia*, above Four Inches below its large interior *Apophyſis*.

The *Semimembranoſus* is faſten'd to the poſterior and ſuperior Part of the *Tibia*.

The *Vaſtus Externus*, the *Vaſtus Internus*, the *Cruræus*, and the *Rectus*, are intermix'd with one another at the inferior Part; and taking their Courſe above the *Rotula*, are faſten'd to the large *Apophyſis*, which has its Poſition at the ſuperior and anterior Part of the *Tibia*, about Two Inches below the large *Apophyſis*.

The *Abductor Longus* is faſten'd to the ſuperior, lateral, and interior Part of the *Tibia*, in a Line or Furrow, which is about Four Inches long.

The *Poplitæus* is faſten'd to the inferior Part of the *Condylus Exterior* of the *Os Femoris*, and ſtretches obliquely over the Two Bones of the Leg, within their Interſtice, and has its Inſertion at the ſuperior, interior, and poſterior Part of the *Tibia*, to wit, in its *Apophyſis*.

The *Tibialis Anticus* has its Riſe at the ſuperior and anterior Part of the *Tibia*, and is faſten'd all along to the Side of the exterior Side of this Bone.

The *Muſculus Solæus* ariſes at the ſuperior and poſterior Part of the *Tibia*, and of the *Perone*, at the Place where theſe Two Bones are conjoin'd together.

The *Tibialis Poſticus* is faſten'd to the poſterior Part of the *Os Tibiæ*, and to a Membrane.

The *Flexor Profundus* has its Origination at the ſuperior Part of the *Tibia*, and of the *Perone*, in that Place where they are articulated together on their poſterior Part.

The *Muſculus Longus* is fix'd to the ſuperior, exterior, and lateral Part of the *Tibia*, in that Place where it is conjoin'd with the *Perone*.

The *Extenſor Proprius Pollicis Pedis* has its Riſe at the ſuperior, lateral, and exterior Part of the *Tibia*, on that Part where it is ſeparated from the *Perone*.

Of the PERONE.

The *Perone* does form the exterior Part of the Leg.

At the ſuperior and interior Part of the *Perone* there is a *Sinus*, which is inveſted with a Cartilage, which does receive the little Head that is ſituated at the upper Part of the *Tibia*, at its poſterior Part, a little ſideways.

At the inferior Part of the *Perone* there is a *Head*, which terminates in a Point, and forms the exterior Part of the Inſtep of the Foot.

At the inferior Part of the *Perone* there is a Head, the interior Side whereof is receiv'd into a Cavity, which forms the inferior and exterior Part of the *Tibia*.

The *Malleolus Externus* and *Internus* do maintain the *Talus* in its Situation, and prevent its Luxation towards the Sides.

The inferior, lateral, and interior Part of the *Head*, which is ſeated at the lower Part of the *Perone*, is articulated with the *Aſtragalus* by an obſcure Articulation.

All along the interior Part of the *Perone* there is a ſharp-edged Line or Ridge, to the whole Length of which is faſten'd a membranous Ligament, which takes up the whole Interſtice betwixt the *Tibia* and the *Perone*, and is tied all along to the exterior Line or Ridge of the *Tibia*.

The Annular Ligament ariſes from the inferior *Head* of the *Perone*, on the anterior Part, and ſtretches to the Appendage of the *Tibia*.

The *Perone* is immoveable in it ſelf, and only follows the Motions of the *Tibia*; quite otherwiſe than what is obſervable in the *Radius* of the Arm, which is moveable. But to counterballance this; whereas the *Cubitus* in the fore Arm is deſtitute either of Flexion or Extenſion, the *Tibia* is capable of moving both to the Right and to the Left, purſuant to the Nature of its Articulation with the *Femur*.

The Tendon of the *Biceps* is faſten'd to the ſuperior and poſterior Part of the unequal Prominency of the *Perone*.

The *Membranoſus* is fix'd to the ſuperior and exterior Part of the *Perone*.

The *Peronæus Anticus* is faſten'd to the exterior and middle Part of the *Perone*.

Under the *Apophyſis*, at the *Head*, which is plac'd at the inferior Part of the *Perone*, which is call'd the *Malleolus Externus*, there is a Hollowneſs, through which the Tendon of the *Peronæus Anticus* does paſs.

The *Peronæus Poſticus* is faſten'd to the ſuperior and exterior Part of the *Perone*.

Through the Chink or Cleft of the *Malleolus Externus*, the Tendon of the *Peronæus Poſticus* takes its Paſſage.

The *Flexor Pollicis Pedis* has its Riſe at the upper Part of the *Perone*, at the Place where it is conjoin'd with the *Os Tibiæ*.

Of the ASTRALAGUS.

The *Aſtralagus* is the higheſt Bone of all that belong to the Foot.

The upper Part of the *Aſtralagus* is very ſmooth, and does make a Kind of a Semicircle, which enters into a Cavity which is plac'd at the lower Part of the *Tibia*, where it is articulated by an obſcure *Ginglymus*.

At the anterior Part of the *Aſtralagus* there is a long *Apophyſis* or *Head*, which enters into a Cavity of the *Os Naviculare*, and is pretty conſiderable.

At the inferior Part of the *Aſtralagus* there is a large Cavity, which does receive the ſuperior Part of the *Calcaneum*.

On the exterior Part of the *Aſtralagus* there is an *Apophyſis*, which is receiv'd into a Cavity of the *Calcaneum*.

At the poſterior and inferior Part of the *Aſtralagus* there is a large Pit or Cavity, within which the *Calcaneum* is encloſed like in a Box.

The interior and lateral Part of the *Aſtralagus* does receive the *Malleolus Externus*.

The *Muſculus Brevis* is faſten'd to the ſuperior and exterior Part of the *Aſtralagus*.

The exterior and lateral Part of the *Calcaneum* receives the *Malleolus Externus*.

At the interior, exterior, and lateral Surface of each Side of the *Aſtralagus* there is a ſmall rugged *Sinus*, into which a Ligament is faſten'd, which ties the Two Bones of the Leg to the *Talus* Each of theſe *Sinus's* is inveſted with a Cartilage: That of the Interior is leſſer than that of the Exterior, becauſe the *Perone*, which makes the exterior Part, does deſcend lower than the *Tibia*.

Upon the Elongation of the *Aſtralagus* there is a *Sinus* or Cavity, in which a ſmall Prominency does enter, which is plac'd at the inferior, anterior, and middle Part of the *Tibia*.

The poſterior Surface of the *Aſtralagus* is narrow and rugged. Upon this Surface there is a Furrow or Gutter betwixt Two Prominencies. It deſcends obliquely; and through it the Tendons of the Muſcles that move the Foot take their Paſſage.

Upon the poſterior Surface of the *Aſtralagus* there is a long Gutter, which reaches from the interior to the exterior Side, and does paſs above the Two Prominencies which are ſituated at the inferior and poſterior Part of theſe Bones. Within this Gutter the Ligament which ties the Two Bones of the Leg to the *Talus* has its Inſertion.

Underneath the *Aſtralagus* there is a long *Sinus*, which ſtretches from the poſterior to the anterior Part laterally. Within this *Sinus* is contain'd a glutinous Matter, which ſerves to moiſten the Cartilaginous Ligaments, which hereabouts do conjoin the *Aſtralagus* with the *Calcaneum*.

Of the CALCANEUM.

The *Calcaneum* is the biggeſt among all the Bones that belong to the Foot. Its Poſition is underneath the *Aſtralagus*, with which it is articulated by a *Ginglymus*. This is the Second of the Bones appertaining to the *Tarſus*.

Upon the ſuperior Surface of the *Calcaneum* there is a large Cavity, into which is receiv'd the inferior Part of the *Aſtralagus*.

The ſuperior Part of the great Cavity of the *Calcaneum* is receiv'd into the inferior Part of the *Aſtralagus*.

At the anterior Part of the *Calcaneum* there is a thick and long *Apophyſis*; at the Extremity of which there is a Cavity or Pit, which receives the *Os Tarſi*, which ſupports the Little Toe, and the next adjacent to it. This Bone is call'd the *Os Cuboides*.

Upon the ſuperior Surface of the *Calcaneum* there is a Gutter, which runs from one Side

Side to the other, and receives the Ligament that ties the *Tibia* to the *Aſtralagus*.

Upon the interior Side of the *Calcaneum*, at the inferior Part, there is a Furrow or Gutter, which has its Poſition underneath a Prominency. Through this the Tendon of the Muſcle that moves the Foot obliquely, and the Tendons of the *Flexores Pedis*, as alſo a Vein, Artery, and Nerve, take their Paſſage.

Upon the poſterior Surface of the *Calcaneum* is faſten'd the large Tendon of *Achilles*, which occupies all this Part; as likewiſe that of the *Solæus*, which are intermix'd; as alſo that of the *Plantaris*.

At the exterior Side of the *Calcaneum* there is a ſmall Furrow, plac'd underneath a ſmall Prominency, which is ſituated at the Beginning of the Elongation of the *Calcaneum*. This Furrow is cover'd with a ſmall Cartilage, over which the Tendon of the *Flexor Obliquus Pedis* does paſs.

The *Palmaris* takes its Paſſage over the interior Side of the *Calcaneum*.

The *Sublimis* is faſten'd to the inferior and interior Part of the *Calcaneum*.

The *Tenar* has its Inſertion at the interior lateral Part of the *Calcaneum*.

The *Hypotenar* of the Little Toe has its Origination at the exterior Part of the *Calcaneum*, and is inſerted in the Bones of the Firſt and Second *Phalanxes*, on the Outſide.

Of the OS NAVICULARE, *or* SCAPHOIDES.

The *Os Naviculare* has its Poſition betwixt the *Aſtralagus* and the Three *Oſſa Cuneiformia*.

At the poſterior Part of the *Os Naviculare* there is a large Cavity or Pit, which is cover'd with a thin Cartilage, into which the anterior *Apophyſis* of the *Aſtralagus* does enter.

Upon the anterior Surface of the *Os Naviculare* there are Three ſmall Pits, which are ſo ſuperficial, that it is hard to judge, whether they do receive, or are receiv'd. To the interior Pit is faſten'd the largeſt of the *Oſſa Cuneiformia*; which is alſo the moſt interior. Unto that of the middle Part is join'd the *Os Cuneiforme Medium*; and to the Third, or the Exterior, is united the *Cuneiforme Externum*, to wit, that which ſtands next to the Little Toe. Theſe Three *Oſſa Cuneiformia* are call'd alſo *Innominata*.

The *Os Naviculare* is the Third Bone of the *Tarſus*.

One of the Tendons of the *Tibialis Poſticus* has its Inſertion into the *Os Naviculare*.

Of the OS CUBOIDES, *or* CUBIFORME.

The Fourth among the Bones of the *Tarſus* is call'd the *Os Cuboides*, from its Figure.

The *Os Cuboides* has its Poſition betwixt the *Calcaneum*, the Little Toes, and that which is next adjacent to it, and is articulated with them.

The Surface of the poſterior Part of the *Cuboides* is ſomewhat round, and is received within the anterior Cavity of the Elongation of the *Calcaneum*.

The anterior Part of the *Os Cuboides* conſiſts of Two diſtinct Surfaces or Sides. The Bone of the *Metatarſus*, which ſupports the Little Toe, is receiv'd at its exterior Surface; and at the interior and anterior, that Bone of the *Metatarſus* which ſuſtains the next adjacent to the Little Toe.

The lateral interior Surface or Side of the *Os Cuboides*, receives that Part of the *Os Cuneiforme* which ſupports the middle Bone of the *Metatarſus*.

At the inferior Part of the *Os Cuboides* there is a long *Gutter*, through which a Tendon paſſes.

The Tendon of the *Peronæus Poſticus* does paſs through the lateral and exterior Part of the *Cuboides*.

The *Antitenar* does paſs through a Gutter of the *Os Cuboides*; and taking its Courſe under the Foot, is faſten'd within the Great Toe, which it draws towards the other Toes.

Of the Firſt OS CUNEIFORME.

The Firſt *Os Cuneiforme* is ſeated betwixt the *Os Naviculare*, under the Great Toe, and that Bone of the *Tarſus* which ſupports the Great Toe. It is the biggeſt of the Three *Oſſa Cuneiformia*.

The anterior Part of the Great and Firſt *Os Cuneiforme* is received into the Bone that ſuſtains the Great Toe.

The interior Side of the Great *Os Cuneiforme* is provided with Pits and Prominencies, which do receive and are received within the Cavities and Prominencies of the Second *Os Cuneiforme*, and on the Side of the Bone of the *Tarſus* which ſupports the Toe that is next to the Great Toe.

One of the Tendons of the *Muſculus Tibialis Anticus* is fix'd to the Firſt *Os Cuneiforme.*

One of the Tendons of the *Tibialis Poſticus* is faſten'd likewiſe to the Firſt *Os Cuneiforme.*

Of the Second OS CUNEIFORME.

The Second *Os Cuneiforme* is ſituated betwixt the Firſt and the Third *Os Cuneiforme*, the *Os Naviculare*, and that Bone of the *Metatarſus* which ſuſtains the Toe that is next to the Great Toe; with which it is articulated by a *Ginglymus.*

At the Middle of the inferior Part of the Second *Os Cuneiforme* there is a ſmall Protuberancy, into which the *Tibialis Poſticus* has its Inſertion.

Of the Third OS CUNEIFORME.

The Third *Os Cuneiforme* has its Situation betwixt the *Os Naviculare*, the *Cuboides*, the Second *Cuneiforme*, and that Bone of the *Metatarſus* which ſupports the middle Toe. It is articulated by an obſcure *Ginglymus.*

Of the Bones of the METATARSUS.

The *Metatarſus* conſiſts of Five Bones, which have their Poſition betwixt the Bones of the *Tarſus* and thoſe of the Toes. Theſe Bones are plac'd cloſe one on the Side of the other, to ſtrengthen and render more firm the Motion of the Foot when we are walking.

Under the Bone of the *Metatarſus* which ſuſtains the Great Toe, on the poſterior Part, there is an *Apophyſis*, which terminates in a Point, into which the Tendon of the *Peronæus*, that moves the Foot obliquely, has its Inſertion.

The Bone of the *Metatarſus* which ſuſtains the Little Toe, has at its poſterior, lateral, and exterior Part, a long pointed *Apophyſis*, unto which the Tendon of the Second Muſcle that bends the Foot is faſten'd.

The *Muſculi Interoſſei* are ſituated in the Interſtices of the Bones of the *Metatarſus.*

One of the Tendons of the *Tibialis Anticus*, is fix'd to the *Os Metatarſi* which ſuſtains the Great Toe.

The Tendon of the *Peronæus Anticus*, is faſten'd to the anterior and ſuperior Part of the Bone of the *Metatarſus* which ſupports the Little Toe.

A Tendon of the *Peronæus Poſticus*, is faſten'd under the Bone of the *Metatarſus* which does ſupport the Great Toe.

The Four *Interoſſei Interni* fill up the Four Interſtices of the Five Bones of the *Metatarſus.*

The Four *Interoſſei Externi* do occupy the ſuperior Part of the Interſtices of the Bones of the *Metatarſus.*

The Bones of the *Metatarſus* are articulated with the Bones of the Fingers by *Arthrodia.*

Of the Bones of the FOOT, *or of the* TOES.

The Foot has Five Toes, as the Hand has Five Fingers; but the Toes are plac'd very cloſe one to another, and much ſhorter; which is the Reaſon why we cannot perform the ſame Actions with the ſame Dexterity as the Hands can. The Great Toe has no more than Two *Phalanxes* or Ranks; but all the reſt have each of them Three.

The Articulation of the Firſt *Phalanx* of the Toes with the Bones of the *Metatarſus* is made by *Arthrodia:* But the Articulation of the Ranks one with another is made by a *Ginglymus*, like thoſe of the Hand.

All the Bones of the Foot are convex above, and concave in their inner Parts.

The Four Tendons of the *Sublimis*, or *Perforatus*, are fix'd upon the Second *Phalanx* of each of the Four Toes, by which they perform their Flexion.

The

The Four Tendons of the *Profundus* are faſten'd upon the laſt Ranks of the Toes.

The Four Tendons of the *Muſculus Longus* are faſten'd all along the Three Bones of each Toe, by which they perform their Extenſion.

The Four *Lumbricales* have their Inſertions at the lateral and interior Part of the Firſt Bones of the Four Toes.

The Four *Interoſſei Interni* are faſten'd to the lateral interior Part of the Firſt Bones of the Toes, which they draw towards the Great Toe.

The Four *Interoſſei Externi* are fix'd to the lateral exterior Part of the Firſt Ranks, which they draw from the Great Toe.

The *Brevis* inſerts his Four Tendons under the Firſt Rank of the Bones of the Four Toes, to wit, at the Great Toe, and the Three next ſucceeding; for the Little Toe does receive none but the *Muſculus Longus*.

The *Flexor Pollicis Pedis* is inſerted in the Bone of the laſt *Phalanx*.

The *Extenſor Pollicis Pedis* has its Inſertion upon the Firſt *Phalanx*.

The *Tenar* has its Inſertion all along the Side of the Two Ranks of the Great Toe.

The *Antitenar* is faſten'd on the inner Side of the Firſt Bone of the Toe.

At the very Extremity of each Bone which does form the Extremity of the Toes, there is a ſmall Prominency, which has the Figure of a Semicircle, upon which each of the Nails of the Toes are fix'd.

Of the Oſſa *call'd the* SESAMOIDEA.

The *Oſſa Seſamoidea* are to be found both in the Hands and in the Feet.

Underneath the Bone of the *Metatarſus* which ſuſtains the Great Toe, there are moſt commonly Two of the *Oſſa Seſamoidea*, to wit, One on each Side, upon the Brink of the Articulation which is made by the Bone of the *Metatarſus* with the Firſt *Phalanx* of the Great Toe. Theſe Two Bones leave an Interſtice betwixt them; and being conjoin'd one with another by Ligaments, cannot move one without the other. A Tendon does paſs betwixt theſe Two *Oſſa Seſamoidea*.

When there is no more than One of theſe *Oſſa Seſamoidea* upon the Edge of the Articulation, it leaves a Cavity in the Middle, into which a Tendon is fix'd, which prevents its ſuffering a Compreſſion.

The *Oſſa Seſamoidea* do ſerve alſo inſtead of Pulleys to the Tendons; and upon that Account are cover'd with Cartilages, and are articulated by a *Ginglymus* with the other Bones, like the *Rotula*.

Whenever the Toes or Fingers are not provided with theſe *Oſſa Seſamoidea*, Nature does ſupply that Defect by ſome ſmall and very ſmooth Cartilages; but otherwiſe theſe *Oſſa Seſamoidea* are extant at all the Articulations of the Toes and Fingers.

The Number of the *Oſſa Seſamoidea* is uncertain; but they are always fix'd upon the Edge of the Articulations of the Fingers and Toes. You may always obſerve Two of them on each Thumb, and as many on each Great Toe. Thoſe of the Toes are moſt commonly more remarkable than thoſe of the Fingers.

A ſhort Recapitulation of all the BONES *of the* Human Body.

AMong theſe, Fifty and one do belong to the Head, to wit, the *Os Frontis*; the *Os Occipitis*; the Two *Oſſa Parietaria*; the Two *Oſſa Temporum*; One *Os Cuneiforme*; Two *Oſſa Unguis*; One *Os Ethmoides*; Two *Oſſa Naſi*; Two *Oſſa Malæ*; Two *Oſſa Maxillæ Superioris*; Two *Oſſa Palati*; One *Os Maxillæ Inferioris*; and Thirty two Teeth.

The *Thorax* conſiſts of Fifty nine Bones, to wit;

Seven *Vertebræ* of the Neck; Twelve *Vertebræ* of the Back; Five *Vertebræ* of the Loins; One *Os Sacrum*; Four *Oſſa Coccygis*; Two

Two *Ossa Innominata*; Two of the *Sternum*; Two *Claviculæ*; Twenty four Ribs.

There are Eighty eight Bones in the Two Feet, to wit;

Two *Ossa Femoris*; Two *Rotulæ*; Two *Ossa Tibiæ*; Two *Perones*; Fourteen *Ossa Tarsi*; Ten *Ossa Metatarsi*; Twenty eight in the Toes of the Two Feet; Twenty eight *Ossa Sesamoidea* in the Two Feet.

There are Ninety Bones in the Two Hands, to wit;

Two *Omoplatæ*; Two *Ossa Humeri*; Four in the fore Arm, to wit, Two *Ossa Cubiti*, and Two *Radii*; Sixteen *Ossa Carpi*; Ten *Ossa* of the *Metacarpus*; Twenty eight in the Fingers of the Two Hands; Twenty eight *Ossa Sesamoidea* in the Two Hands.

Of the Head,	51
Of the *Thorax*,	59
Of the Two Feet,	88
Of the Two Hands,	90
The Sum Total,	288

The Number of 288 must be underst[ood] of such Persons as are neither too young nor too old: For the younger the Persons are, the more Bones they have, because One Bone does consist in young Infants of several others; and the older the Persons are, the fewer Bones they have, because some of their Bones are contracted together, and make up but One Bone.

A Recapitulation of all the Articulations of the BONES.

THE Bones that belong properly to the *Cranium* are conjoin'd together by Indenting, which are call'd Sutures.

These Articulations are *Synarthrodial Symphyses*; that is to say, they are made for the firm Conjunction of the Bones, without a Motion.

The *Ossa Temporum* are articulated by a Suture with all the Bones that are join'd with them: But the scaly Part of this Bone is call'd a false or spurious, or scaly Articulation, because it does slip over the *Parietalia* like the Scales of Fish. This Articulation also is a *Synarthrodial Symphysis*, *i. e.* without Motion.

All the Bones of the Face are articulated one with another on their inner Side by a Suture, *i. e.* they have certain Tooth-like Edges, which are indented within one another: For though on the exterior Surface there do not appear any Indentations, but only a bare Line or Streak; yet if you separate these Bones, the Indentations are conspicuous on the interior Part. The same Bones of the Face are articulated also with one another by *Harmonia* on the exterior Surface, *i. e.* by a simple Line: But if you take a near View of them, you may discover something like an Indentation.

The Inferior *Maxilla* is articulated with the *Os Temporum* by *Arthrodia*, *i. e.* it has a small flat *Head*, which is received into a superficial Cavity of the *Os Temporum*.

The Teeth are articulated within the Two *Maxillæ* by *Gomphosis*, to wit, like Pegs are driven into Holes. 'Tis a *Synarthrosis*, *i. e.* an Articulation without Motion.

The *Os Hyoides* is by its inferior *Cornua* join'd with the Wings of the Cartilage *Thyroides*, and by its superior with the *Processus Styloides*, by the Means of Ligaments; so that these Sorts of Articulations may be call'd a *Syndesmosis*.

The Head is articulated with the First *Vertebra* of the Neck by a double *Diarthrodial Arthrodia*, to wit, where Two Prominencies, or flat *Apophyses*, are receiv'd into Two superficial Cavities of the First *Vertebra*. It is a *Diarthrodial* Articulation, because it is form'd for the facilitating of a Motion. 'Tis by Means of this Articulation that the Head performs its streight Motions, to wit, those of Extension and Flexion.

The Head is articulated likewise with the Second *Vertebra* of the Neck by a *Diarthrodial Arthrodia*; for the *Apophysis Odontoides* of this *Vertebra* is receiv'd into a small Ca-

vity

vity of the *Os Occipitis*, by Means of which the Head turns about.

The *Apophyſis Odontoides* of the Second *Vertebra* of the Neck, is artiuclated with the Firſt *Vertebra* by a *Diarthrodial Arthrodia*; for there is a ſmall flat Cavity at the interior and anterior Part of the Firſt *Vertebra*, which does receive a ſmall Protuberancy, which is ſituated at the anterior Part of the *Apophyſis Odontoides*.

The Firſt *Vertebra* of the Neck is articulated with the Second by a *Diarthrodial Arthrodia*; for it has Two ſuperficial Cavities, which receive Two ſuperficial Prominencies of the Second *Vertebra*. This Firſt *Vertebra* has this peculiar, That it receives in all its Parts, and is not receiv'd by any; for it does receive the *Occiput* on its ſuperior Part, the ſecond *Vertebra* on its inferior, and the *Proceſſus Odontoides* at its interior Part. All the other *Vertebræ* of the Spine do receive and are receiv'd.

All the *Vertebræ* of the Spine are articulated together by a *Ginglymus*; for the ſame *Vertebra* does receive on its ſuperior Part, betwixt its Two ſuperior Proceſſes, the *Vertebra* that is next above it, and the inferior Proceſſes of the ſame *Vertebra* are receiv'd betwixt the Two *Apophyſes* of the inferior *Vertebra*. This is call'd the *diſtant Ginglymus*, becauſe the Bone does receive at one End, and is receiv'd at the other; whereas in a *near Ginglymus*, the Bone receives and is receiv'd at the ſame End. This Articulation is beſt diſcernable in the *Vertebræ* of the Loins.

All the *Vertebræ* are articulated with one another by their Bodies; for they are all plac'd one upon another. This is call'd a *Synchondrochial* Articulation, which is made by an intermedious Cartilage.

The *Os Sacrum* is articulated with the laſt *Vertebra* by a double *Arthrodia*; for the Two flat inferior Proceſſes of the laſt *Vertebra* are receiv'd into Two flat Cavities of the *Os Sacrum*.

The *Os Sacrum* conſiſts moſt commonly of Five Pieces, which are join'd together by a *Synchondroſis*, or Cartilages, which turn oſſeous; ſo that theſe Five Pieces make no more than One Bone in Adults.

The *Os Sacrum* is articulated with the *Os Ilium* by *Ginglymus*, becauſe it has certain Cavities and Prominencies, which receive the Prominey and the Cavities of the *Oſſa Innominata*.

The Two *Oſſa Innominata* are conjoin'd together by a *Synchondroſis*, *i. e.* by a Cartilage, and with the *Os Sacrum* by *Ginglymus*.

The *Coccyx* is join'd with the *Os Sacrum* by *Sineuroſis*, or *Syndeſmoſis*, *i. e.* by a Ligament.

The Bones of the *Sternum* are conjoin'd together by *Synchondroſis*, *i. e.* by a Cartilage.

The Seven *true* Ribs are articulated with the *Sternum* by *Synchondroſis*, *i. e.* by an intermedious Cartilage.

The Five *falſe* or *ſpurious* Ribs are articulated with the *true* Ribs by a *Synchondroſis* alſo.

All the Ribs are articulated in their poſterior Parts with the *Vertebræ* of the Back by *Ginglymus*, *i. e.* by a reciprocal Reception of the Ribs and of the *Vertebræ*.

The *Clavicula* is articulated with the *Sternum* by *Arthrodia*, and by *Synchondroſis* with the *Omoplata* at the *Acromium*.

The *Omoplata* is conjoin'd with the Ribs by a *Syſarcoſis*, *i. e.* by Fleſh; and with the *Clavicula* by *Synchondroſis*.

The *Humerus* is articulated above with the *Omoplata* by an *Enarthroſis*, or *Arthrodia*, *i. e.* a large *Head* is receiv'd into a Cavity.

The *Humerus* is articulated below with the *Cubitus* by *Ginglymus*. It is the moſt remarkable of all the reſt. It is articulated alſo with the *Radius* by *Arthrodia*; for a ſmall Head is receiv'd into a flat Cavity, which is ſituated at the End of the *Radius*.

The *Cubitus* is articulated with the *Humerus* by a *Ginglymus*; for theſe Two Bones receive one another reciprocally.

The *Radius* is articulated with the *Humerus* by a ſlender *Arthrodia*, and with the *Cubitus* by *Arthrodia*; for the *Cubitus* has at the Side of its ſuperior Part a Cavity, in which the Edge of the Cavity of the *Radius* does turn.

The inferior Extremity of the *Cubitus* is articulated with Two Bones of the *Carpus* by an *Arthrodia Diarthrodialis*, and with the *Radius* likewiſe by an *Arthrodia*.

The

The *Radius* is articulated with the Bone of the *Carpus* that lies under the Little Finger, by a ſlender *Arthrodia*.

The Four Bones of the laſt Rank, *i. e.* thoſe that are plac'd neareſt to the Fingers, are articulated with thoſe of the *Metacarpus* by an *Arthrodia Synarthrodialis*, *i. e.* by an *Arthrodia* without Motion; but this being an obſcure Motion, participates rather of a *Ginglymus*.

All the Bones of the *Carpus* are articulated with one another by *Ginglymus*.

The Firſt *Phalanxes* or Ranks of the Fingers are articulated with the *Metacarpus* by *Arthrodia*.

All the Ranks of the Fingers are articulated with one another by a *Ginglymus Synarthrodialis*.

The *Os Femoris* is articulated with the Cavity of the *Iſchium* by an *Enarthroſis Arthrodialis*; for a large Head is receiv'd within a deep Cavity; which Articulation ſerves to facilitate a conſiderable Motion. This is the largeſt *Enarthroſis* of all the Bones.

The *Rotula* is articulated with the inferior Extremity of the *Femur* by *Ginglymus*; for it has Two Cavities and One Prominency in the Middle, which are conjoin'd with Two Prominencies and One Cavity of the *Femur*.

The *Tibia* is articulated with the *Femur* by *Ginglymus*; for the *Tibia* has Two Cavities, which receive the Two Prominencies of the inferior Extremity of the *Femur*. In the Middle of theſe Two Cavities there is a Prominency, which is receiv'd into the Interſtice of the Two Prominencies of the *Femur*.

On the Side of the *Tibia* there is a ſmall Prominency, which enters into the ſmall Cavity of the *Perone*, which may be call'd an *Arthrodia*.

The *Tibia* is articulated on the lower Part with the *Aſtralagus* by *Ginglymus*; for the *Tibia* has Two Cavities and One Prominency, which receive Two Prominencies and a Cavity of the *Aſtralagus*.

The *Tibia* has a Cavity on its inferior, exterior, and lateral Part, which does receive the inferior Part of the *Perone*. This is an obſcure Articulation, becauſe the Two Bones are flat in that Part. You may, if you pleaſe, call it an *Arthrodia*.

The *Perone* is articulated with the *Aſtralagus* in ſo obſcure a Manner, that it can ſcarce be brought within the Compaſs of any Kind of Articulation, becauſe it is very hard to diſtinguiſh which of theſe Two Bones does receive or is receiv'd, they being both flat in that Place.

The *Aſtralagus* is articulated with the *Tibia* by *Ginglymus*; for it has Two Prominencies and One Cavity, which are received into the Two Cavities of the *Tibia*, and the Prominency of the *Tibia* is receiv'd into the Cavity of the *Aſtralagus*.

The great anterior *Apophyſis* of the *Aſtralagus* does enter into the Cavity of the *Naviculare*; ſo that theſe Two Bones make an *Arthrodia Synarthrodialis*, for a ſmall Head does enter into a ſmall Cavity, and the Motion of theſe Bones is not manifeſt to our Senſes.

The *Aſtralagus* is conjoin'd with the *Calcaneum* by Three Cavities and as many Prominencies, which reciprocally enter within one another, to wit, One of theſe Bones has Two Prominencies and One Cavity, and the other Two Cavities and One Prominency; ſo that it makes a *Ginglymus Synarthrodialis*; the Motion of which is obſcure, if not perceptible.

The *Calcaneum* (as we told you) is conjoin'd with the *Aſtralagus* by *Ginglymus*. It has a ſuperficial Cavity at the Extremity of its large anterior *Apophyſis*, which receives the *Os Cuboides*; ſo that this Articulation is an *Arthrodia Synarthrodialis*, it having no Motion.

The *Os Naviculare* has Four Cavities. The Firſt does receive the *Aſtralagus*, and makes an *Arthrodia Synarthrodialis*. Its other Three Cavities, which are very ſhallow and ſuperficial, receive the Three *Oſſa Innominata*, and thus make Three Articulations *Arthrodiales Synarthrodiales*.

The *Os Cubiforme* has a ſuperficial Head which is receiv'd in the Cavity of the *Calcaneum*, and forms an *Arthrodia Synarthrodialis*. At its inferior Part it does receive Two Bones of the *Metatarſus*, which make Two Articulations, that do participate of an *Arthrodia*, or rather of an *Arthrodia Synarthrodialis*.

The Three *Oſſa Innominata* are articulated with the Three Bones of the *Metataſus*

Plate 1.st

Fig: I.

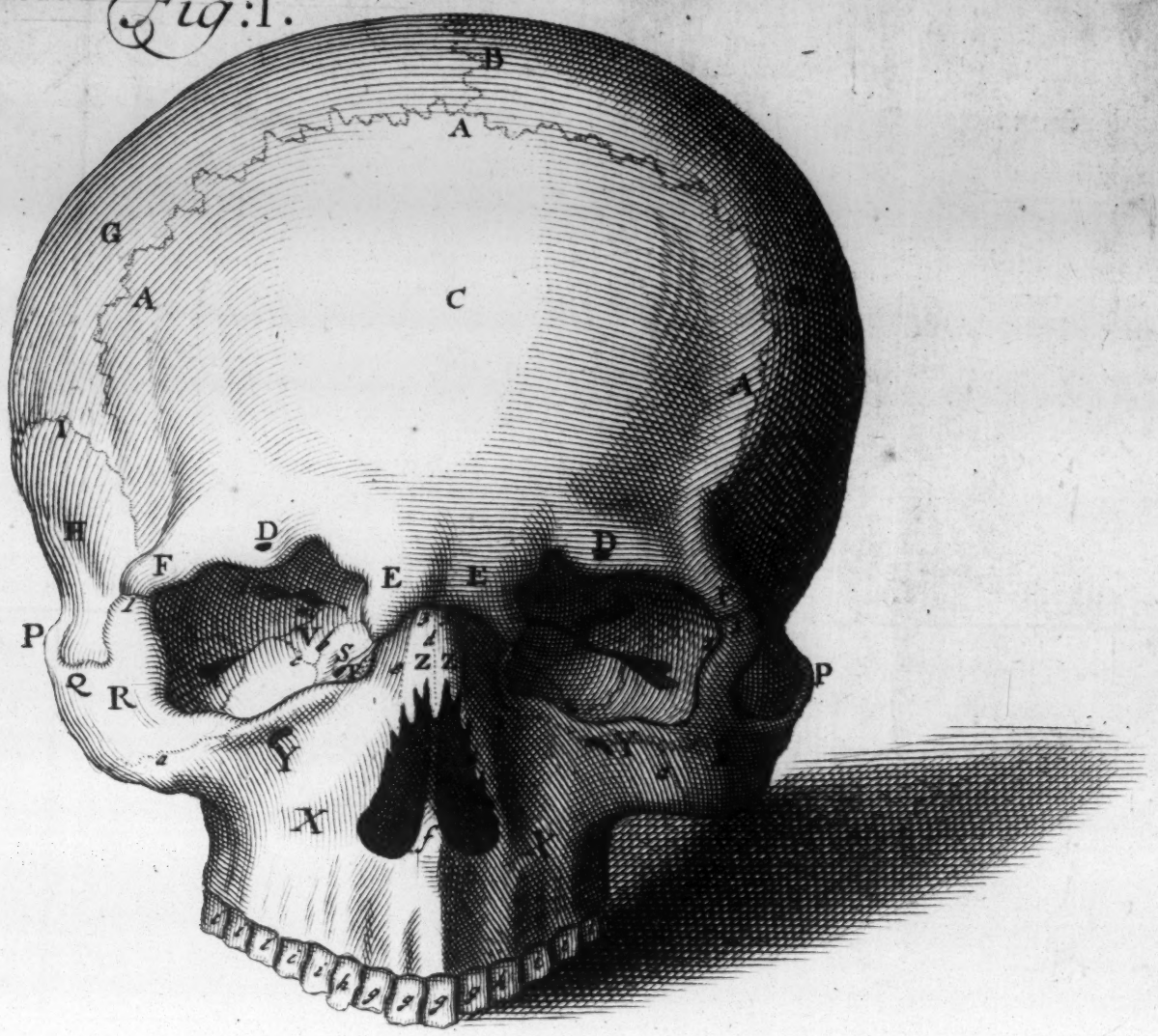


Fig: II.

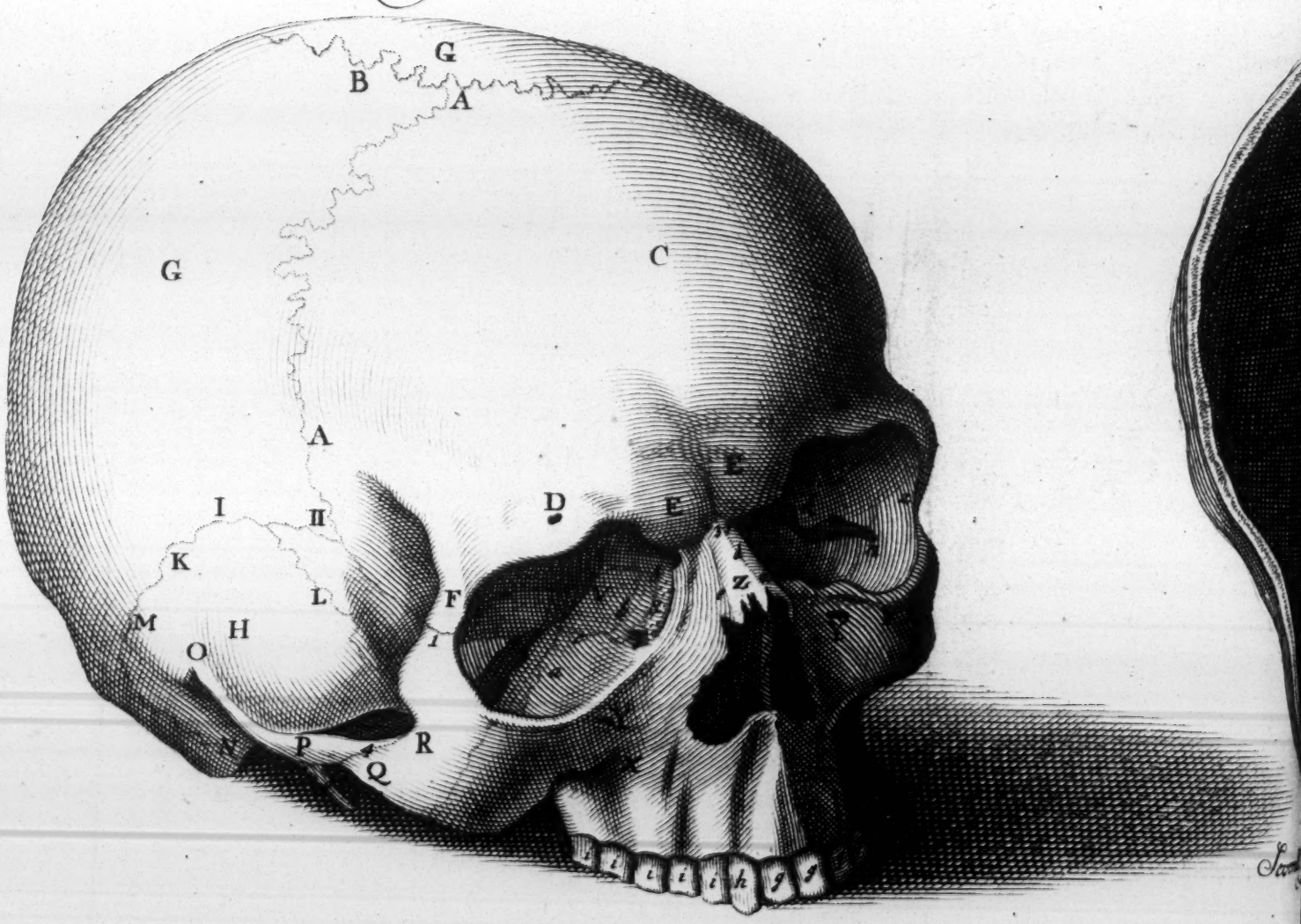


Fig: III.

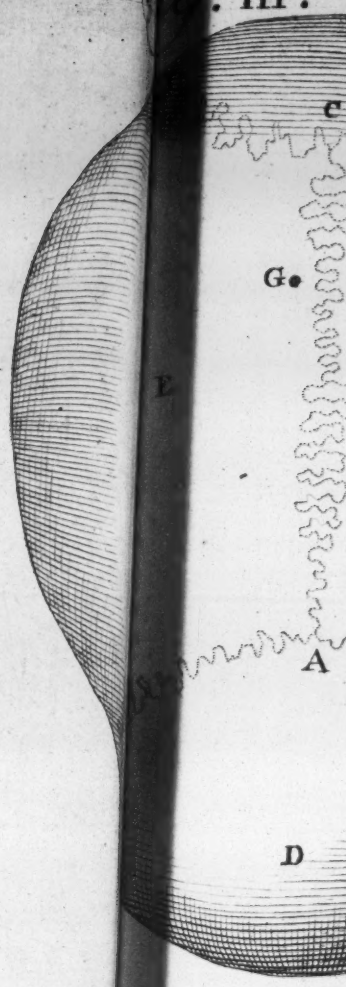
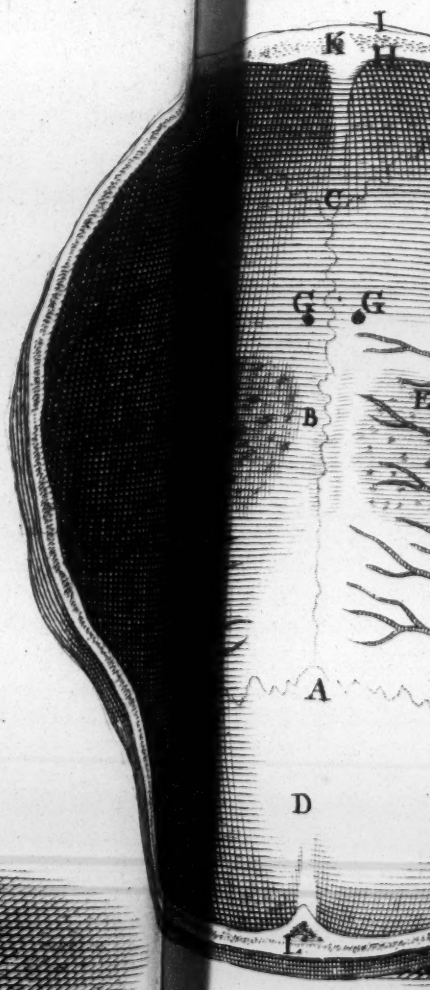


Fig: IV



Several Figures relating to the Bon

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: III.

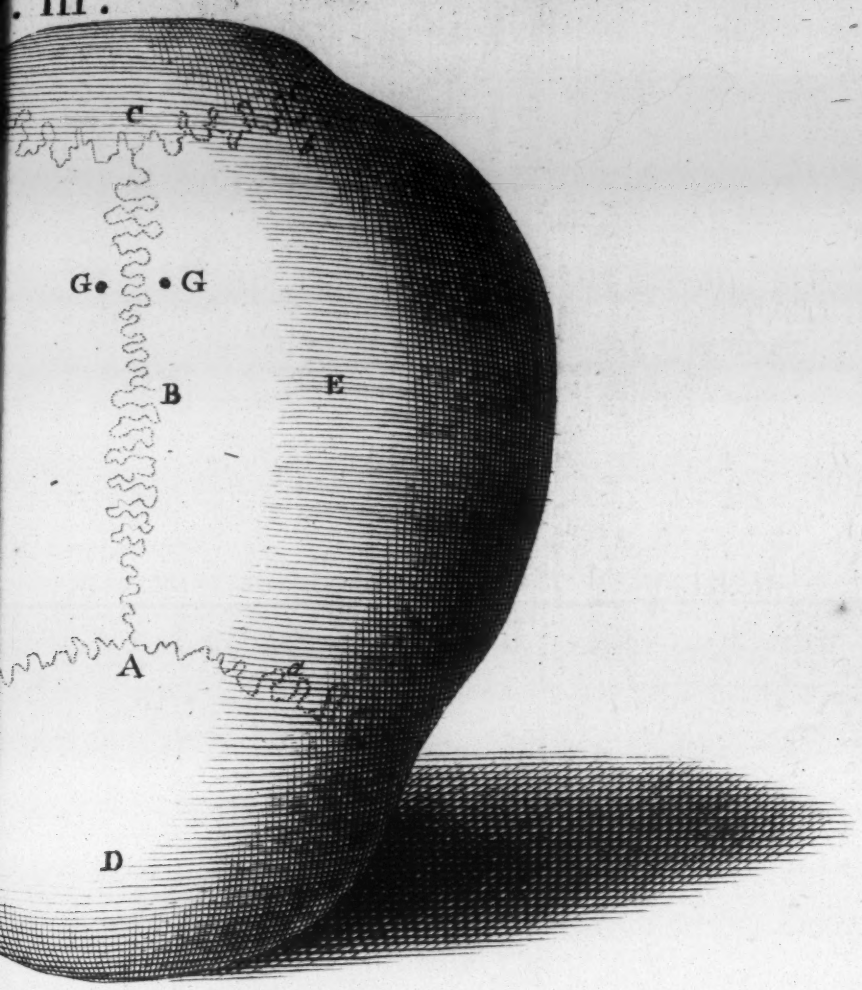


Fig: IV

Fig: V.

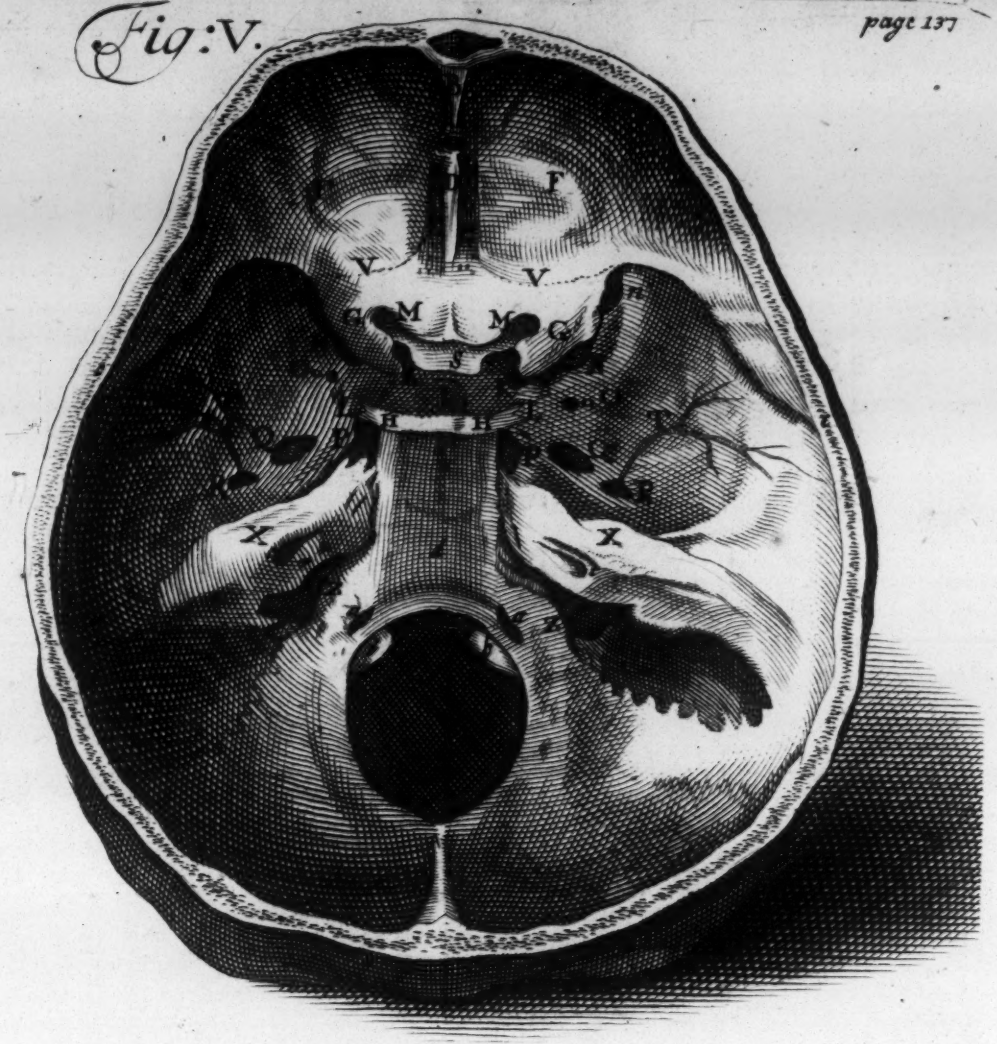
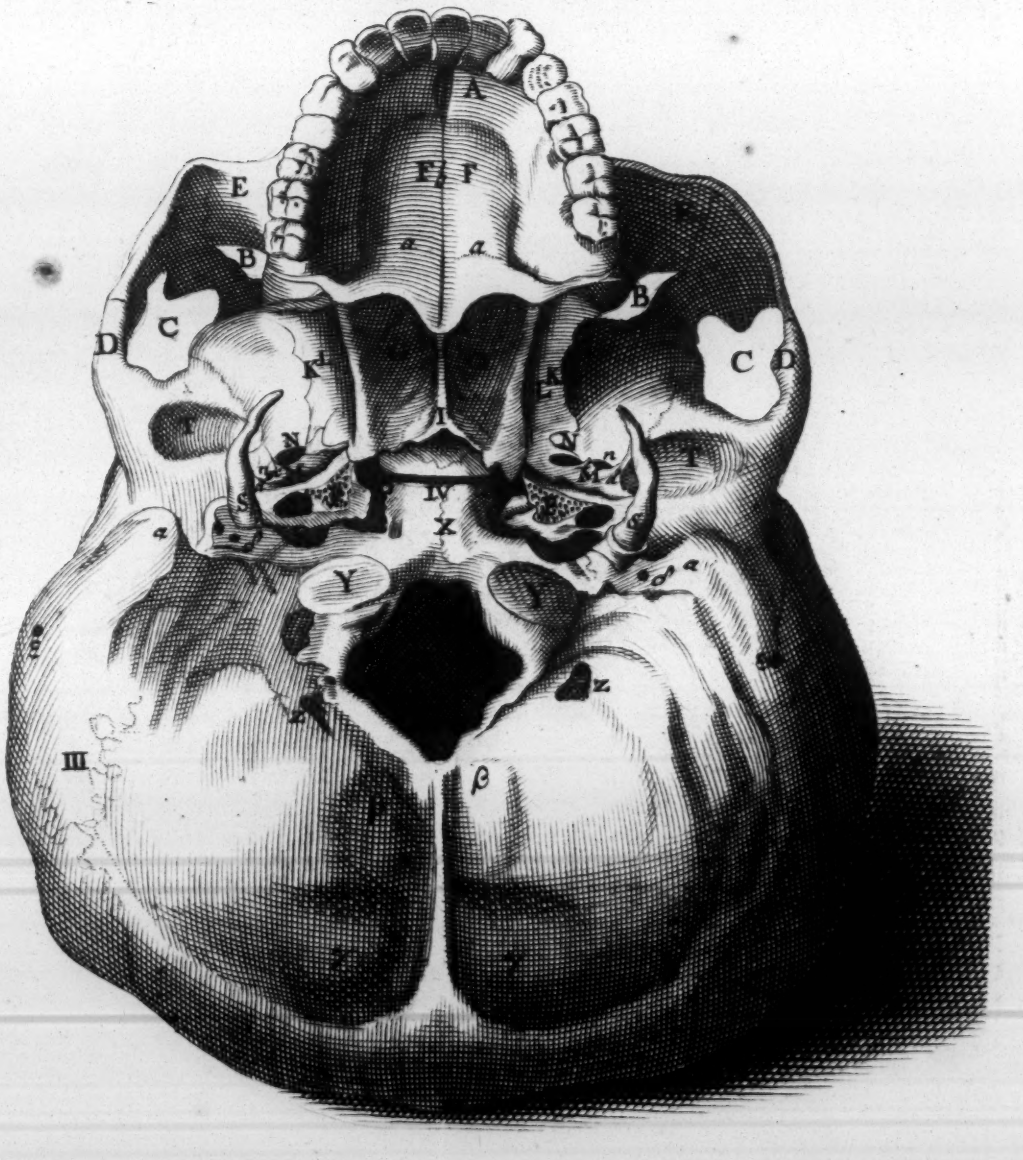


Fig: VI.



relating to the Bones of the Head Design'd by Spigelius. &c.

Arthrodia, or rather by an *Arthrodia Synarthrodialis*.

All the Bones of the *Metatarsus* are articulated one with another on the Side by *Ginglymus Synarthrodialis*, or without Motion.

The Five Bones of the *Metatarsus* are articulated with the Four Bones of the *Tarsus* by *Arthrodia Synarthrodialis*; for the flat *Heads* are receiv'd into superficial Cavities.

The Five Bones of the *Metatarsus* are articulated with the Five First *Phalanxes* or Ranks of the Toes by an *Arthrodia Synarthrodialis*.

All the Bones of the Toes are articulated with one another by *Ginglymus*.

An Explanation of the Figures relating to the Osteology of the Humane Body: Taken out of *Spigelius*'s History of the BONES.

The Two First Figures represent the anterior and lateral osseous Part of the Head, to wit, the Ossa Frontis, Syncipitis, Occipitis, Temporum, *and the Superior* Maxilla, *and the greatest Part of the Sutures; which being of different Kinds, we have taken this Method in these Figures that relate to the Head, to wit, to indigitate the* true *Sutures by the Capital Letters; the* false *or* spurious, *by* Roman *Numbers; but the* common, *by Cyphers or common Numbers; and those that are* proper *to the* Maxilla Superior, *by small Letters.*

The Characters are common to both the Figures. If any of them appertain peculiarly to One, it is indigitated by a Number that is added after its Explication.

A, A. THE First of the true Sutures, *viz.* the *Coronalis*, which surrounds the *Os Frontis*.

B. The Second of the true Sutures, to wit, the *Sagittalis*.

C. The *Os Frontis*.

D, D. Two *Foramina* belonging to the *Os Frontis*, at the middle Part of the Eye-brow, through which passes the First Branch of the Third Pair of Nerves of the Brain, from the Orbit of the Eye into the Muscles of the *Frons*, or rather of the Eye-brows.

E, E. The Two *exterior* or large Processes of the *Os Frontis*.

F, F. The Two *interior* or lesser Processes of the *Os Frontis*.

G, G. The Bones of the *Synciput*, or of the *Vertex*.

H, H. The *Ossa Temporum*.

K, L, 2. The superior and circular Part of the *Ossa Temporum*, where they are articulated with the exterior Sides of the *Ossa Syncipitis*.

M, 2. The posterior Part of the *Ossa Temporum*, where they are articulated with the *Os Occipitis* by a false Suture.

N, 2. The *Processus Mammillaris* of the *Os Temporum*.

O, 2. The *Meatus Auditorius*.

o, 2. The *Processus Styloides*.

P, 2. The Procels of the *Os Temporum*, that forms the *Os Jugale*.

P, Q. The *Os Jugale*.

R, R. The First Bone of the ſuperior *Maxilla.*

S, S. The Second Bone of the Upper Jaw, where are to be obſerved the *Foraminula*, as deſineated in the ſecond Figure.

T, T. A pretty large *Foramen* of the ſaid Second Bone, ſtretching directly downwards into the Cavity of the Noſe, unto which is adjoin'd the *Glandula Lacrymalis.*

V, V. The Third Bone of the ſuperior *Maxilla.*

X, X. The Fourth Bone of the Upper Jaw.

Y, Y. The Firſt *Foramen* of this Fourth Bone, through which the Second Branch of the Third Pair of Nerves of the Brain is emitted through the Orbit of the Eye into the Muſcles of the Face.

Z, Z. The Fifth Bone of the ſuperior Jaw.

I. The Firſt } Pair of the ſpurious Su-
II. The Second } tures.

1, 1. The Firſt
2, 2. The Second } Pair of the common Su-
3, 3. The Third } tures.
4, 4. The Fourth

a. a. The Firſt
b, b. The Second } Pair of the Sutures
c, c. The Third } proper to the Upper
d, d. The Fourth } Jaw.
e, e. The Fifth

f. The Third Part of the *Os Spongioſum*, which forms the *Septum* of the Noſe.

g, g. The Four Teeth call'd the *Inciſores.*

h, h. The Two call'd the *Canini.*

i, i, i, i. The Ten *Molares*, Five on each Side.

K, K. The Firſt *Foramen* of the *Os Cuneiforme*, plac'd in the moſt interior Part of the Orbit of the Eye, through which the Firſt Pair of the Nerves of the Brain have their Egreſs out of the Skull.

L, L. The Second *Foramen* of the *Os Cuneiforme*, three times larger than the former; through the *inferior* Part of which, *Firſt*, the Second Pair of the Nerves of the Brain proceeds into the Orbit; *Secondly*, the Third Pair alſo; *Thirdly*, a remarkable Branch of the *Arteria Carotides* goes to the Eyes; *Fourthly*, the *Pituita* which is collected in the *Glandula Pituitaria*, and produces the Tears. Through its *ſuperior* Part a Vein paſſes from the Eye to the Membrane of the Brain.

M, M. The Third *Foramen* of the *Os Cuneiforme*, through which the Firſt Branch of the Fourth Pair of Nerves of the Brain is tranſmitted to the Temporal Muſcles, and thoſe that are within the Mouth.

N, N. The Fourth *Foramen* of the ſame Bone, ſituated at the exterior Part of the Eye, being the biggeſt of all that belong to the *Orbit.* Through this the Fourth Branch of the Third Pair of Nerves of the Brain, as alſo the Firſt Branch of the Fourth Pair, take their Egreſs into the Temporal Muſcles, and the *Pituita* that falls upon the *Orbita* deſcends into the Throat.

The Explication of the Third and Fourth Figures in the Firſt Table, repreſenting the ſuperior Part of the Skull, ſeparated from the lower Part on both Sides, to wit, as well the interior as exterior, ſo as to diſtinguiſh the ſmooth Surface of the Firſt, and the rough or unequal of the other; but eſpecially the true Sutures, and their different Appearances on both Sides.

A, A. The Firſt of the *true* Sutures, to wit, the *Coronalis*, in the external Surface of the Third Figure, appears like ſuch; whereas on the interior Surface, or in the Fourth Figure, it is like a *Harmonia*, or a Line.

B. The Second of the *true* Sutures, to wit, the *Sagittalis*, near which are to be ſeen ſome Holes, ſuch as are found in ſome Skulls.

C, C. The Third of the *true* Sutures, the *Lambdoiformis.*

D. The *Os Frontis.*

E, E. The Bones of the *Synciput.*

F, F. The Marks of the Jugular Veins, which creep through the thick Membrane of the

the Brain, and which render the interior Surface of the Bones of the *Synciput* somewhat unequal.

G. Two *Foramina*, through which Two ſmall Veins of the cutaneous Veins of the Head have their Ingreſs to the oſſeous Marrow of the Bones of the *Synciput*, plac'd betwixt the Two *Lamina*, for the Nouriſhment of the ſaid Bones.

H, 2. The interior *Lamina* of the Skull.

I, 2. The exterior *Lamina* of the Skull.

K, 2. The Marrow that is encloſed betwixt theſe Two Tables.

L, 2. A pretty large Cavity in the *Os Frontis*, betwixt both theſe *Laminæ*, at the Root of the Noſe; being ſometimes ſingle, as it is here repreſented; but moſt frequently double, and ends in the Cavity of the Noſe.

a, 1. The anterior Line of the Bones of the *Synciput*.

b, 1. The poſterior Line of the Bones of the *Synciput*.

The Fifth and Sixth Figures repreſent the inferior Part or the Baſis *of the Skull, ſeparated from the ſuperior: In the Fifth Figure the interior, and in the Sixth the exterior Part.*

A. A Part of that Cavity in the *Os Frontis* which in the preceding Figure was mark'd with I.

B. Some Proceſſes of the *Os Frontis*, which make Way for the Third *Sinus* of the thick Membrane of the Brain, which ſtretches towards the Noſe.

C. A pretty large *Foramen*, through which a Vein aſcends from the Cavity of the Noſe to the Membrane of the Brain.

D. The Proceſs of the *Os Cribroſum*, call'd the *Criſta Galli*.

E, E. The *Os Cribroſum*, or *Spongioſum*, with a vaſt Number of Holes.

F, F. The Protuberancies of the *Os Frontis*, which form the ſuperior Part of both the Orbits of the Eyes.

G, G. The interior Proceſſes of the *Os Cuneiforme*, the anterior being mark'd with *G, G.* and the poſterior with *H, H.* which make the *Sella Equina*, or *Turcica*. The thick Membrane of the Brain grows very cloſe to them.

I. The *Sinus* in the Middle of the *Sella*, which contains the *Glandula Pituitaria*. From this *Sinus* are derived Two Ducts on each Side, the Two anterior of which, mark'd *K, K.* take their Courſe to the Second *Foramen* of the *Os Cuneiforme*, and carry the *Pituita* to the Eye; from whence it is afterwards convey'd to the Noſe. The Two poſterior, mark'd with *L, L.* ſtretch to the *Foramen Aſperum*, or the Fifth of the *Os Cuneiforme* to the Palate.

M, M. The Firſt *Foramen* of the *Os Cuneiforme*, deſign'd for the Ingreſs of the Optick Nerves.

N, N. The Second *Foramen* of the ſame Bone, deſign'd for the Second Pair of Nerves.

n, An oblong Cleft made by this Hole, as it ſtretches upwards.

O. The Third Hole of the ſame Bone.

P, P. The Fifth *Foramen* of the *Os Cuneiforme*, through which a large Branch of the *Arteria Carotides* aſcends into the Head.

Q. Q. The Sixth *Foramen* of the *Os Cuneiforme*, being of an oval Figure, which gives Paſſage to the Fourth Pair of Nerves of the Brain.

R, R. The Seventh Hole of the ſame Bone, being very ſmall, it gives Paſſage to the Second and leſſer Branch of the internal *Jugular* Vein, the Impreſſions of which are obſervable in the Bones of the *Synciput*.

S. A *Sinus* of the *Os Cuneiforme*, where the Optick Nerves have their Concourſe.

T, T. The Marks or Tracts of the *Jugular* Veins, which aſcend through the *Foramen*, mark'd with *R*.

t, t. The Firſt *Foramen* of the *Os Temporum*, which gives Paſſage to the Auditory Nerve.

X, X. The *Proceſſus Petroſus* of the *Oſſa Temporum*.

Y. The Firſt and Largeſt *Foramen* of the

Occiput, through which deſcends the Spinal Marrow.

Z, Z. The Second and Third *Foramen* of the *Occiput*, through which the larger Branch of the internal *Jugular* Vein, and the leſſer of the *Arteria Carotides*, have their Ingreſs, and the Sixth Pair of the Nerves of the Brain has its Egreſs.

a, a. The Fourth and Fifth *Foramen* of the *Os Occipitis*, through which deſcends the Seventh Pair of Nerves of the Brain.

b, b. The Points of the *Occiput*, whereby it is articulated with the Firſt *Vertebra* of the Neck.

c, c. The Marrow of the Skull.

d. The Additament of the *Os Occipitis.*

V, V. Shew the Fifth Proper and Spurious Suture. Theſe Characters muſt not be taken for Letters here, but for the Number of *Five*, repreſented according to the *Roman* Characters, as has been ſhewn before.

a, a. The Sixth proper Suture of the ſuperior *Maxilla.*

b. The Seventh proper Suture of the Upper Jaw.

A. The Second *Foramen* of the Fourth Bone of the Upper Jaw.

B, B. The Fourth *Foramen* of the *Os Cuneiforme.*

C, C. The Cavity form'd by the *Os Jugale*, for the Paſſage of the Tendon of the Temporal Muſcle.

D, D. The *Os Jugale.*

E, E. The interior Part of the Firſt Bone of the ſuperior *Maxilla.*

F, F. The Sixth Pair of the Bones of the ſuperior *Maxilla*, which form the Palate.

G, G. The *Foramina* which terminate in the Cavity of the Noſe.

H. The *Septum* or Partition of the Noſe.

I. The inferior Part of the *Septum*, reſembling a Ploughſhare.

K, K. The Firſt exterior Proceſs of the *Os Cuneiforme*, reſembling the Wings of Bats.

L, L. The Cavity of theſe Proceſſes.

M, M. The Second exterior Proceſs of the *Os Cuneiforme*, with Two ſharp Points.

c, d. The Two Points of theſe Proceſſes wherewith it protuberates towards the *Proceſſus Styloides.*

N, N. The *Foramen* mark'd with *Q, Q.* in the next preceding Figure.

n, n. The *Foramen* mark'd there with *R, R.*

O, O. The *Foramen* mark'd there with *P, P.*

P, P, Repreſents the Unequality of the *Os Petroſum.*

Q, Q. The Second *Foramen* of the *Oſſa Temporum*, through which the larger Branch of the *Arteria Carotides* is convey'd obliquely to the Fifth *Foramen* of the *Os Cuneiforme*, and from thence to the Ventricles of the Brain.

R, R. The *Foramina* of the *Occiput*, mark'd with *Z, Z.* in the next preceding Figure.

S, S. The *Proceſſus Styloides* of the *Os Temporum.*

T, T. The Firſt *Sinus* of the *Oſſa Temporum*, which receives the Head of the *Inferior Maxilla.*

X. The Additament of the *Os Occipitis.*

Y, Y. The Two ſmall Points of the *Os Occipitis.*

Z, Z. The *Foramina* mark'd with *a, a,* in the next preceding Figure.

α, α. The Mammillar Proceſſes.

β, β. The *Sinus's* in the *Occiput* for the *Muſculi Recti.*

γ, γ. The *Sinus's* for the *Muſculi Splenii* and *Cucullares.*

δ, δ. The Fourth *Foramen* of the *Os Temporum.*

ε, ε. The Fifth *Foramen* of the *Os Temporum.*

I, *ı.* The Firſt Pair of the common Sutures.

III. The Third Pair of the ſpurious Sutures.

IV. The Fourth Pair of the ſpurious Sutures.

A ſhort Explication of the Foramina *that give Paſſage to the Seven Pair of Nerves of the Brain through the Skull, as repreſented in the Fifth Figure.*

The Firſt Pair through the Firſt *Foramen* of the *Os Cuneiforme*, mark'd with *M, M.*

The Second and Third Pair, through the Second *Foramen* of the ſame Bone, mark'd with *N, N.*

The

Plate 2.d

Fig: V

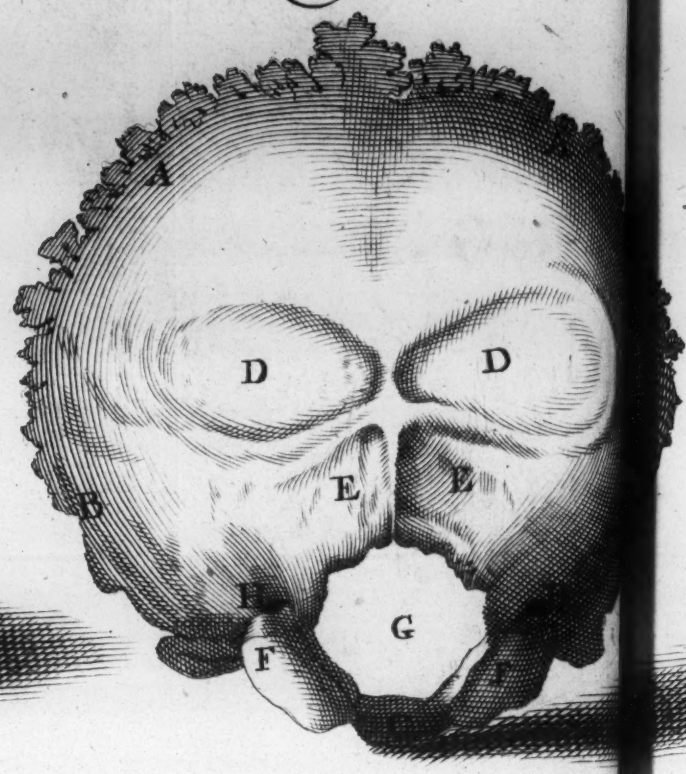


Fig: VII

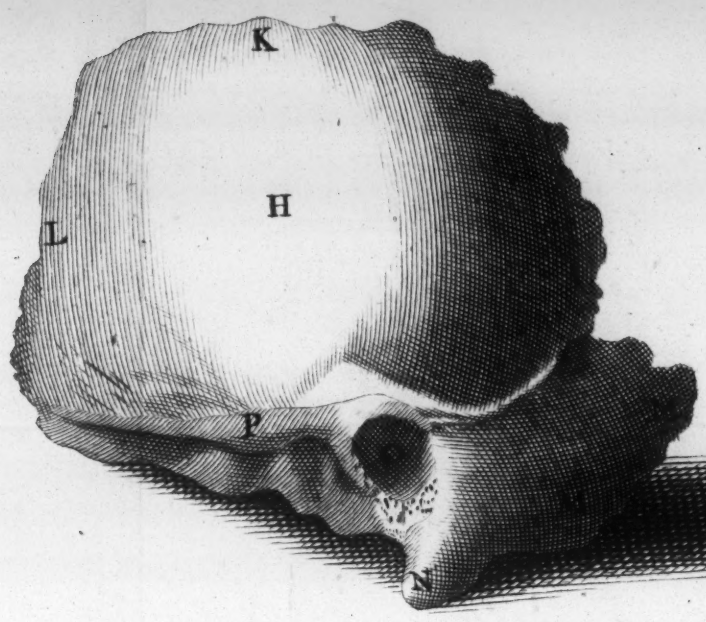


Fig: VIII

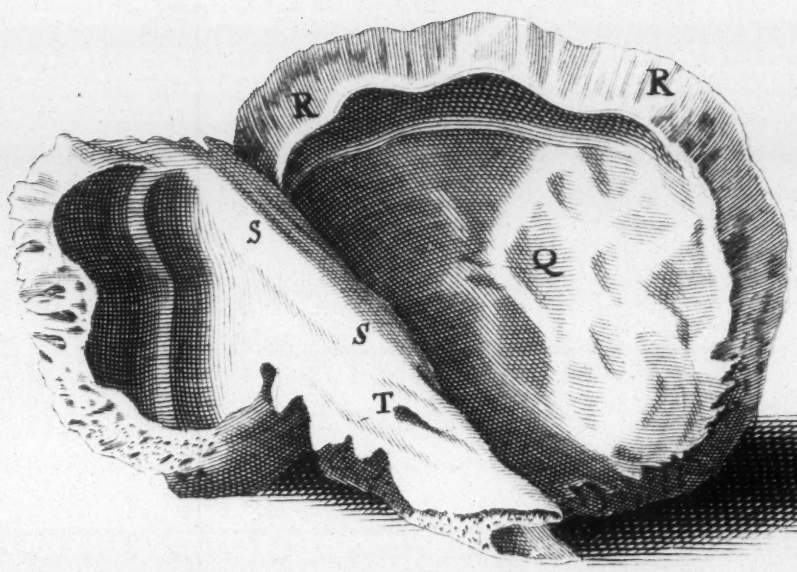
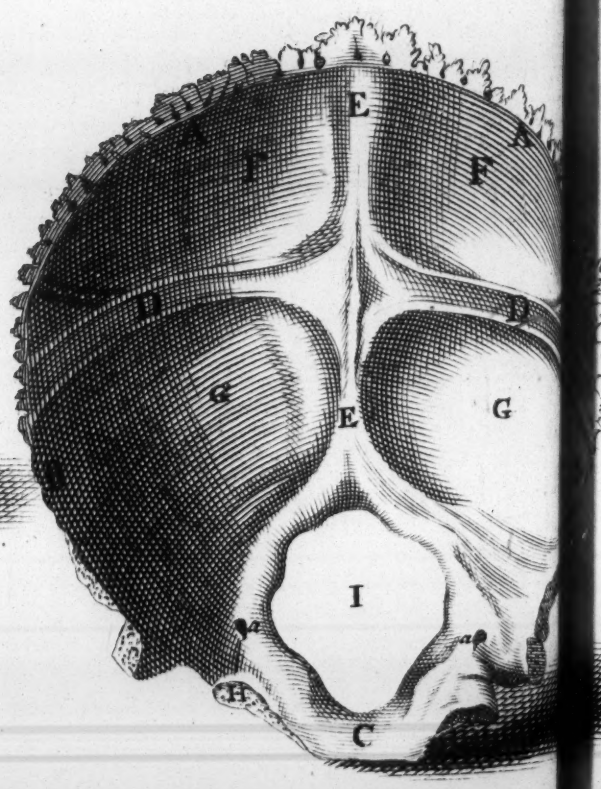


Fig: VI



Eight Seperate figures of the Chief Bones of the Skull

Fig: III

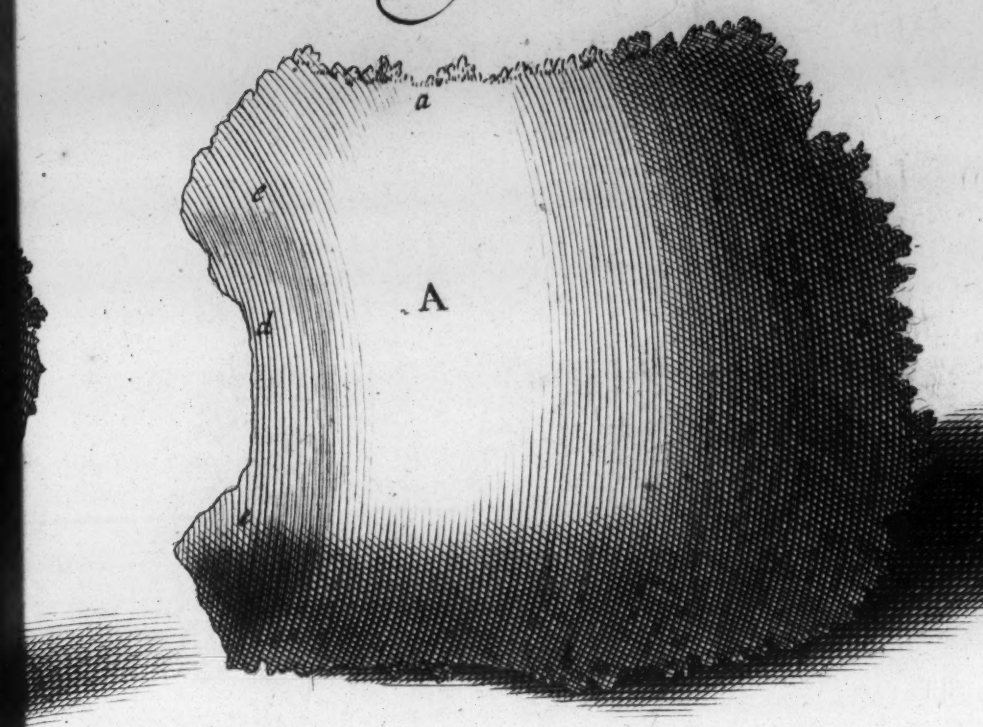


Fig: I

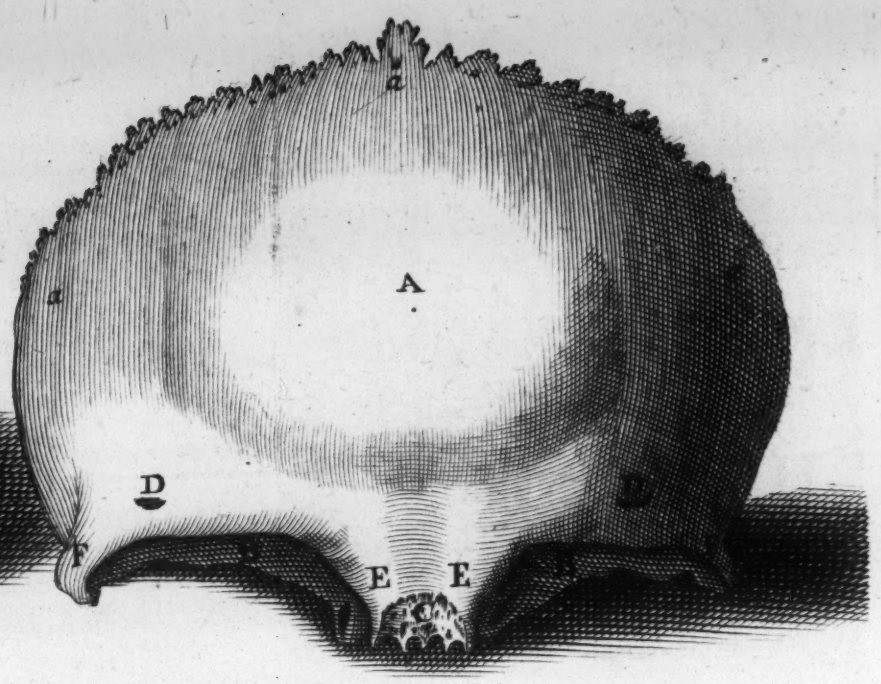


Fig: IV

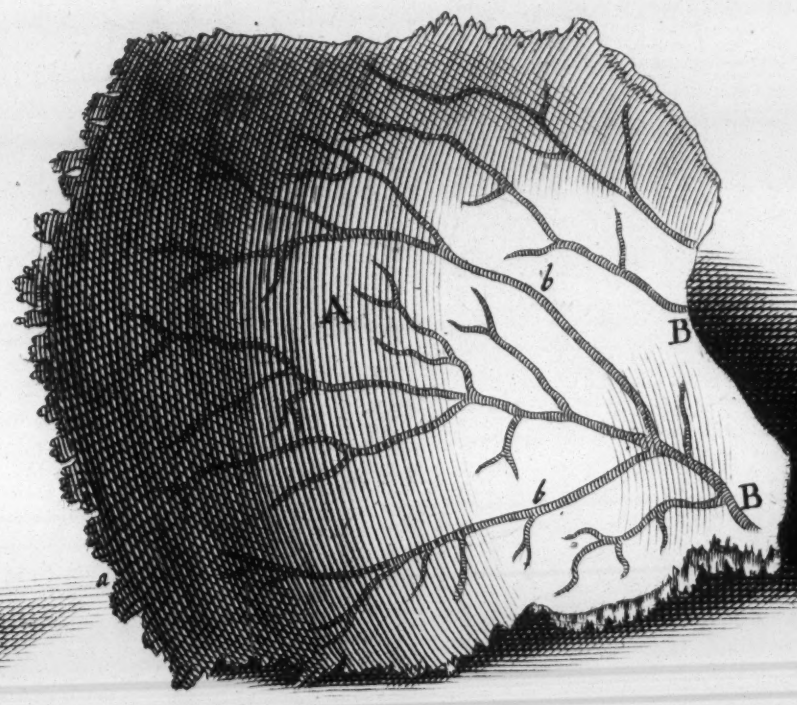
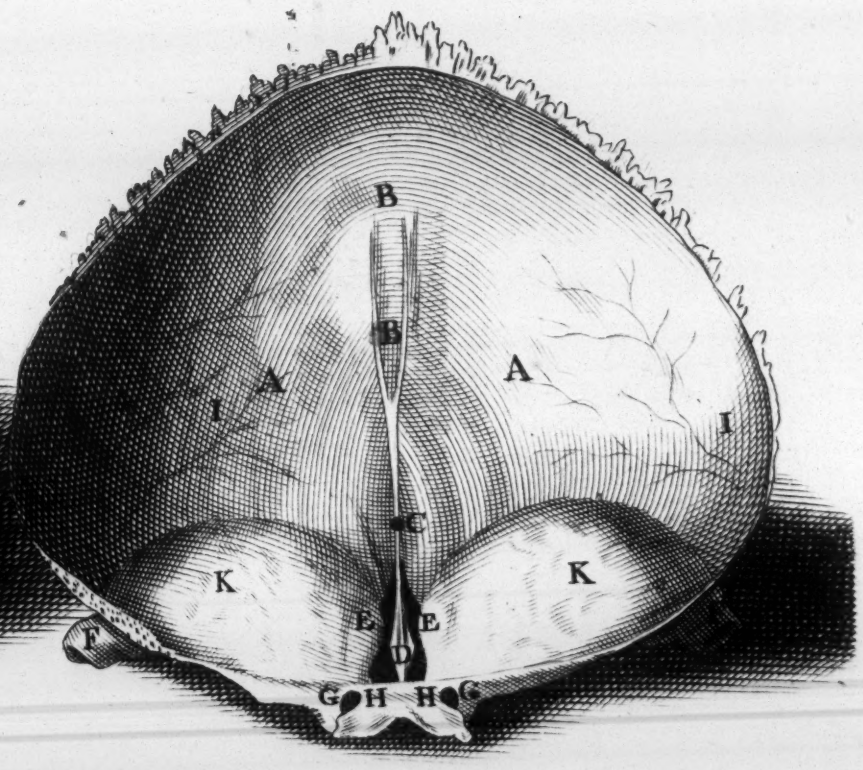


Fig: II



of the Skull by Epigelius &c.

The Fourth Pair through the Sixth *Foramen* of the ſame Bone, mark'd with *Q, Q.*

The Fifth Pair through the Firſt *Foramen* of the *Oſſa Temporum*, mark'd with *t, t.*

The Sixth Pair through the Second and Third *Foramen* of the *Os Occipitis*, mark'd with *Z, Z.*

The Seventh Pair through the Fourth and Fifth *Foramen* of the *Os Occipitis*, mark'd with *a, a.*

An Explication of the chief Bones of the SKULL, repreſented in the Eight following Figures ſeparately.

FIGURE I. *repreſents the anterior and convex Part of the* Os Frontis.

A. The convex Part of the *Os Frontis.*

a, a, a, An exact Delineation of the *Sutura Coronalis.*

B, B. The *Lamina* which forms the ſuperior Part of the Orbit of the Eye.

C. The Inequality unto which the Bones of the Noſe are conglutinated.

D. The *Foramina* through which the Firſt Branch of the Third Pair of Nerves of the Brain paſſes into the Muſcle of the *Frons.*

E, E. The interior Proceſſes of the *Os Frontis.*

F, F. The exterior Proceſſes of the *Os Frontis.*

FIGURE II. *repreſents the poſterior or concave Part of the* Os Frontis.

A, A. The concave Part of the *Os Frontis.*

B, B. The *Sinus* in the *Os Frontis*, about that Part of it where the Third *Sinus* of the thick Membrane of the Brain deſcends, to prevent its Compreſſion by the hard Bone.

C. The *Foramen*, through which a Vein aſcends from the Cavity of the Noſe to the Membrane of the Brain.

D. The Proceſs of the *Os Cribroſum*, call'd the *Criſta Galli.*

E, E. The *Os Cribroſum, ſive Spongioſum.*

F, F. The exterior and leſſer Proceſſes of the *Os Frontis*

G, G. The interior and large Proceſſes.

H, H. The *Foramen* that gives Paſſage to the Optick Nerve into the Orbit of the Eye.

FIGURE III. *repreſents the ſuperior and convex Part of the Right Side of the* Os Syncipitis.

A. A Delineation of the convex Part of the *Os Syncipitis.*

a. The anterior Line, which makes one Half of the *Sutura Coronalis*, where it is articulated with the *Os Frontis.*

b. The poſterior Line, which makes the middle Part of the *Sutura Lambdiformis*, where it is conjoin'd with the *Os Occipitis.*

c. The interior Line, which makes the *Sutura Sagittalis*, by which the Bones of the *Vertex* are conjoin'd with one another.

d. The exterior Line, where it is articulated with the *Oſſa Temporum* by the *Sutura Squammoſa.*

e, e. An exact Delineation of the *Connexio Squammoſa.*

FIGURE IV. *repreſents the concave or inferior Part of the Right Side of the* Os Syncipitis.

A. The concave Part of the *Os Syncipitis.*

a, a. The *Meditullium* betwixt the Two *Laminæ.*

B, B. The Beginning of the Tracts made by the *Jugular* Veins, which are diſperſed through the thick Membrane of the Brain.

b, b, b. The Branches of theſe Tracts.

FIGURE

FIGURE V. *The exterior Surface of the* Os Occipitis.

A, A. The First and Second Side of the *Os Occipitis.*
B, B. The Third and Fourth.
C. The Fifth Side.
D, D. The ſuperior and remarkable *Sinus's*, both for the Muſcles that extend the Head, and thoſe that move the *Scapula* towards the Back.
E, E. The inferior *Sinus's* for the *Muſculi Recti* that extend the Head.
F, F. The ſmall Heads that are inarticulated with the First *Vertebra* of the Neck.
G. The First *Foramen* of the *Os Occipitis*, through which the Spinal Marrow deſcends from the Skull.
H, H. The *Foramina* for the Seventh Pair of the Nerves of the Brain.

FIGURE VI. *repreſents the interior Part of the* Os Occipitis.

A, B, C. Shew the ſame Thing as in the next preceding Figure.
D. The tranſverſe *Sinus*, which receives the First and Second *Sinus* of the thick Membrane of the Brain.
E, E. The ſtreight *Sinus*, deſign'd for the Third *Sinus* of the Membrane of the Brain.
F, F. Two round *Superior Sinus's*, which lodge the Two Prominencies of the Brain, under which are the *Inferior*, mark'd with *G, G.* deſign'd for the Prominencies of the *Cerebellum.*
H, H. The Two Heads, which were indigitated in the preceding Figure by *F, F.*
I. The First *Foramen* of the *Os Occipitis.*
a, a. The *Foramina* for the Seventh Pair of Nerves of the Brain.

FIGURE VII. *repreſents the exterior Part of the* Os Temporum *of the Right Side.*

H. The exterior Side of the *Os Temporum.*
I, K, L. Its ſuperior Part, where it is conjoin'd with the exterior Sides of the *Oſſa Syncipitis.*
M, M. Its poſterior Part, where it is articulated with the *Os Occipitis* by the Third ſpurious Suture.
N. The *Proceſſus Mammillaris.*
O. The *Meatus Auditorius.*
P. The Proceſs of the *Os Temporum*, which, in Conjunction with the First Bone of the Upper Jaw, forms the *Os Jugale.*

FIGURE VIII. *ſhews the interior and concave Part of the* Os Temporum *of the Right Side.*

O. The concave Part of the *Os Temporum.*
R, R. An exact Delineation of the *Connexio Squammoſa.*
S, S. The *Proceſſus Petroſus* of the *Os Temporum.*
T. The *Foramen* through which the Auditory Nerve paſſes.

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The Hiſtory of the BONES: Taken out of *Adrian Spigelius*'s Fabrick of the *Humane Body*.

CHAP. I.

Treats of the Cranium, *or the* Skull, *in general, and of the* Sutures *of the* Head *in particular.*

THE *Brain*, which is the Nobleſt of all the *Viſcera*, being plac'd in the moſt eminent Station of the Body, where it muſt needs be expoſed to external Injuries, provident Nature has incloſed it within an oſſeous Integument or Fence, the better to defend it againſt all external Violences. This Fence is not fram'd out of One ſolid Bone, but of ſeveral, which are join'd together by a peculiar Kind of Articulation, the like of which is not to be found in any other Part of the whole Body: For ſince it was not the only Function appropriated to the Skull, to ſerve inſtead of a Fence, but alſo had another Uſe aſſigned to it, (which it has in common with the other Bones) to wit, to ſerve for a Support to that Part of the Body, Nature has made Uſe here of a peculiar Contrivance, to keep the Brain as it were in Suſpence, by conveying ſome of the Fibres of that *hard Membrane* which covers and incloſes the Brain, through theſe Sutures of the Head. For the Subſtance of the Brain being very ſoft, if it were deſtitute of ſuch-like a Support, which might keep it in an *Equilibrium*, it would be in great Danger (by reaſon of its Bulk and Ponderoſity) either of falling too cloſe together, or of ſtriking againſt the Skull upon every violent Motion.

This Articulation of the Bones of the Skull has, beſides this, another and no leſs conſiderable Uſe than the former, to wit, That ſince the *Cranium* was to be plac'd in a high Place, and conſequently muſt be affected by the continual aſcending Vapours, there might not be wanting ſufficient Paſſages for the Expulſion of them; and this End is moſt conveniently anſwer'd by the *Sutures*. Whence it is frequently ſeen, that thoſe who have no Sutures are ſubject to continual Pains in the Head.

Some there are who have aſſign'd a Third Uſe alſo to thoſe Sutures, *viz.* That in caſe of a Fracture of One of the Bones of the *Skull*, the ſame might not be communicated to another, but end at the Suture: But I can ſpeak it upon my own Experience, that this Uſe is founded upon a very frivolous Reaſon; for I have often obſerv'd the Fractures to penetrate through the *Sutures* from one Bone into the other.

The Bone therefore that covers the Brain is call'd the *Calvaria*, the *Cranium*, (from the *Greek*) the *Skull*. Its Subſtance differs in reſpect of the Age; for in new-born Children it is rather membranous than oſſeous, eſpecially near the Sutures; and above all, at the *Sutura Coronalis*, where it retains its Softneſs for ſeveral Years after the Child is born, even ſo as to give way to the Hand or Fingers, if it be touch'd. Nor is it of the ſame Thickneſs even in adult Perſons, for it is much thicker in aged People than in young Men, and in Men than in Women: And if we may believe *Ovidius*, there is a

conſi-

conſiderable Difference alſo in its Thickneſs, according to the Climate; for he tells us, That the *Indians* have ſuch thick Skulls, that a ſharp-edged Sword cannot penetrate into it. Beſides that, the *Skull* is not every where thick alike in one and the ſame Subject, as will be evident from the Account we are to give of each particular Bone of the *Cranium*.

Its Figure is round, but oblong, being ſuch as is moſt proportionable to the Brain, for the Sake of which it was made. Its Surface, both the *exterior* and *interior*, is ſmooth: The interior was to be ſo left it ſhould impair the *Dura Mater*, and the exterior leſt it ſhould be injurious to the *Pericranium*. The Firſt nevertheleſs has ſome Inequalities, which ſeem to be the Tracts of the Veſſels of the Brain; and the latter has ſome Proceſſes, for the Origination of ſome Muſcles.

It conſiſts of Two very thin but very hard Bones, one *interior*, and the other *exterior*, betwixt which is contain'd a Subſtance, ſpongious, not unlike a Pumice-Stone, and full of Blood and Marrow, ſuch as is to be obſerved in other Bones alſo, as in thoſe of the *Tarſus* and of the *Carpus*. Theſe Two Bones are call'd by the Anatomiſts the Two *Laminæ*, or Tables of the Skull; the exterior of which is thicker and harder, and the interior both thinner and ſofter: Whence it is, that ſometimes in caſe of violent Blows or Falls on the Head, the interior Table is fractured, and the exterior remains entire. Both theſe Tables are thicker in Men than in Women, and in aged Perſons than in young People. This is the famous *Diploe* of *Hippocrates*, which he *(Lib. de Vulner. Cap.)* ſays, 'is ſpongious, 'and that the Bone it ſelf contains abun-'dance of moiſt Caruncles..

The Skull therefore conſiſting of ſeveral Bones, articulated together by Means of the Sutures, before we enter upon a particular Conſideration of each of theſe Bones, it will be requiſite we ſhould ſay ſomething before hand concerning the Nature and different Kinds of theſe *Sutures*.

A *Suture* is, as we have ſaid before, a certain Conjunction of the Bones of the Head, reſembling to Things that are ſewed together with a Thread.

I call it a *Conjunction*, to ſhew its *Genus*, to wit, that it is not an *Union*, but an Articulation; and its *Form* is explain'd by the laſt Words, becauſe the Word *Suture* has obtained its Denomination from its Reſemblance to ſuch Pieces of Cloth as are ſewed together: And this Kind of Articulation does not belong to any other Bones, but is peculiar only to thoſe of the Head, theſe being the proper Subject of the *Sutures*; and this Articulation is ſo very peculiar to them, that as it belongs only to the Bones of the Head, ſo it is never without it, or at leaſt very ſeldom, to wit, in ſome very aged Perſons, in which theſe Sutures, in Proceſs of Time, and with Age, are obliterated, and united by Coalition, in the Nature of Appendages, when it thus happens. The Suture of the *Occiput* is moſt commonly the *firſt*; the *next* the *Sagittalis*; after this the *Coronalis*; and laſt of all the *Temporales*, or the *Squammoſæ*. They are the ſame in Number in both Sexes; ſo that *Ariſtotle* is in the wrong when he aſſerts, *(l. 2. de Part. c. 7.)* That the Males have more Sutures than the Females; it being quite contrary to daily Experience: Nay, they are all of them extant in Infants; but theſe are rather Lines or Harmonies than Sutures.

They are diſtinguiſh'd by Anatomiſts into *proper* and *common* Sutures: They call thoſe *proper Sutures* which are peculiar only to the *Cranium*; and *common Sutures* thoſe which belong both to the *Cranium* and to the *Os Cuneiforme*, and the ſuperior *Maxilla*. The *proper Sutures* are ſubdivided into *true* and *ſpurious*: Of the firſt there are Three, and of the latter Five. The *true* Ones have this Peculiar, that they are always *ſingle*; but the *ſpurious double*, and have a Fellow. Thus there is but one *Sutura Coronalis*, one *Sagittalis*, one *Lambdoides*; but the *ſpurious* have their Fellows, one being ſituated on the Right, and the other on the Left Side, as the *Squammoſæ* are on each Side.

The Firſt therefore of the *true Sutures* is call'd the *Coronalis*, becauſe it encloſes the anterior Part of the Head like a Crown.

The Second is call'd *Lambdoides*, either from the *Greek* Λ, or *Ypſiloides*, from the *Greek* Υ, unto which it has ſome Reſemblance. It might not improperly be call'd the Suture of the *Occiput*.

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The Suture that is ſituated betwixt theſe Two is call'd the *Sagittalis*, from its Reſemblance to an Arrow.

The *Sutura Coronalis* is of a ſemicircular Figure, and reaches tranſverſe from one of the Temples to the other. By the Means of this Suture the *Oſſa Frontis* are articulated with the *Oſſa Syncipitis*.

The *Lambdoides* is that Suture which reſting upon the Baſis of the *Occiput*, and with its Divarications at the *mammillar Proceſſes* on both Sides, makes the *Vertex*, or the moſt eminent Part of the *Occiput*.

The *Sutura Sagittalis* is that Suture which being plac'd in the Middle betwixt them, conjoins the *Vertex* of the *Lambdoidales* with the Middle or Center of the *Coronalis*. Theſe are call'd the *true Sutures*, becauſe they actually reſemble unto Pieces of Cloth that are ſew'd together with Thread; whereas the *ſpurious* are altogether like a ſimple Line. But even theſe *true Sutures* do not appear in the Form of true *Sutures* in both the Tables, but only in the exterior or ſuperior *Lamina*; for in the interior they appear like an *Harmonia*; which is the Reaſon why the interior Suture is much ſooner obliterated or aboliſh'd than the exterior. In ſome Heads they are cloſer, in ſome more looſe, in ſome larger, and in others ſmaller.

Among the *ſpurious* or *falſe Sutures*, the *firſt Pair* is the largeſt and moſt conſpicuous, being like ſcaly Combinations; from whence they have alſo taken their Denomination of *Squamoſæ*, or *Squamiformes*. By this, the Bones of the *Vertex* and of the *Tempora* are articulated together, in ſuch a Manner, as that the Extremities of the thick Bone terminate in an exact acute Line, in the Nature of Scales; ſo that the Firſt grow thicker at the external, and the latter at the internal Part or Edge. They begin at the poſterior Side of the *Baſis* of the *mammillar Proceſſes*, and by a circular Progreſs are carried to the Sides of the Head, and ſo form the whole Side of the *Cranium*.

The *Second Pair* is ſituated on the Side of the Head, and in its whole Courſe keeps Company with the anterior and ſuperior Part of the *Firſt Pair*, beginning at its ſuperior Part, and ſtretching obliquely downwards to the Origin of the *firſt common Suture*.

The *Third Pair* is plac'd at the *Baſis* of the poſterior Part of the Head. Its Beginning is continuous with the Origin of the Divarications of the *Lambdoidal* Suture, at the *Baſis* of the *mammillar Proceſſes*; near the poſterior Sides of which it is carried obliquely to the *Baſis* of the Head, where the ſmall Heads are by which it is articulated with the Firſt *Vertebra*.

The *Fourth* Pair makes a tranſverſe Line near the *Proceſſus Pterigoides*, on both Sides of thoſe *Aſperities* that are made by the Extremities of the *Oſſa Sphænoides* and *Temporum*.

The *Fifth Pair* does run in the anterior Part of the interior Skull, tranſverſedly to the inferior Angles of the *Os Cribroſum*, and makes rather an *Harmonia* than a Suture in one ſtreight Line; though actually they are Two, made by the Two Sides of the *Os Cuneiforme*, where it is conjoin'd with the *Os Frontis*.

Of the *common Sutures* there are alſo *Five*. The *Firſt* is ſeated obliquely on the exterior Part of the Eye-brow, and articulates the exterior Proceſs of the *Os Frontis* with the firſt Bone of the ſuperior *Maxilla*. The *Second* is plac'd on the external and lateral Part of the Eye, beginning almoſt at the Extremity of the Second proper ſpurious Suture, and extending in a ſtreight Line to the *Foramen* of the Cavities of the Temples. It is common to the *Os Cuneiforme*, and to the Firſt Bone of the ſuperior *Maxilla*. The *Third* is ſituated in the riſing Part of the Orbit of the Eye and the uppermoſt Part of the Noſe, reaching obliquely from the Root of the firſt to the upper Part of the laſt. It articulates that *Lamina* of the *Frons* which makes the ſuperior Part of the *Orbit*, and the interior Proceſs, with the Second, Third, Fourth, and Fifth Bones of the ſuperior *Maxilla*. The *Fourth* ſtands obliquely in the very Middle of the *Os Jugale*, and articulates the Firſt Proceſs of the *Temporal Bone* with the Firſt Bone of the ſuperior *Maxilla*. The *Fifth* being ſeated betwixt the *Proceſſus Pterigoides*, ſtretches forward, being common both to the *Os Cuneiforme* and to the *Septum Narium*.

CHAP. II.

Treats of the Bones *of the* Head, *or of the* Skull *in Particular.*

THE Skull (as we told you before) conſiſts of Six Bones, belonging properly to it, to wit, One of the *Frons* and of the *Occiput*, Two of the *Synciput*, and Two *Temporal*, all which are articulated together by the Sutures.

The Firſt is the *Os Frontis*, which being plac'd in the anterior Part, occupies the whole *Front*, or Forehead, and the ſuperior and riſing Part of the *Orbit* of the Eyes. It is almoſt of a circular Figure, not unlike a deep Diſh, excepting that near the Eyes it declines from its Rotundity into a ſtreight Line. It has alſo a conſiderable Cavity, which is the Receptacle of the anterior convex Part of the Brain. On its ſuperior Part it is articulated with the Two Bones of the *Synciput* by the *Sutura Coronalis* ; on its inferior Part with the Bones of the ſuperior *Maxilla*, and th *Os Cuneiforme* ; and on its lateral Parts with the Two Proceſſes of the *Os Cuneiforme*, which reſemble unto the Wings of a Bat.

Its Subſtance is not quite ſo thin as that of the *Oſſa Syncipitis*, nor altogether ſo thick as that of the *Occiput* ; but after all, it is not thick alike every where, for in that Part which makes the riſing Part of the Orbit of the Eyes, it is thinner than any where elſe, though it is thin alſo where it is conjoin'd with the *Temple-Bones* : But in all the other Parts where it makes the *Frons*, it is thicker than the Bones of the *Synciput*, or the *Vertex*, and has a double *Lamina*, which contains a Subſtance not unlike the Pumice-Stone ; but ſtill as it approaches nearer unto the Bones of the *Synciput*, where it is join'd with it, it grows thinner and thinner. In Adult Perſons it is but One ſingle Bone ; but in young Infants it conſiſts of Two, being divided by the *Sutura Sagittalis*, which reaches down to the Noſe.

Ariſtotle tells us, That the ſame Thing is obſervable in all Women, even after they are arrived to a full Age ; but this is contrary to daily Experience. In this Bone is obſervable a pretty large Cavern, ſeated betwixt the Two *Laminæ*, at the Root of the Noſe. Sometimes there is but One, but ſometimes Two, ſeated on both Sides, at the ſuperior Part of the Eye-brows ; from whence Two Holes are expanded to the Cavity of the Noſe. It is inveſted with a greeniſh Membrane, which contains a viſcid Matter, not unlike the Subſtance of the Brain. 'Tis the common Opinion, That it contributes towards the Shrilneſs of the Voice ; but I am rather apt to believe, that it is deſign'd for the Advantage of Smelling, becauſe here the Air, which is impregnated with the Scent, is taken in and preſerved, that it may not paſs through the Noſe with too much Swiftneſs. An Inſtance of this Kind we have in the *Auricula*, or *External Ear*, which Nature has placed and expanded on the Sides of the Head, to check as it were the ſwift Motion of the Air, fill'd with the Sound. This Bone has Two *Foramina*, or Holes, in the middle Part of the *Supercilia*, which terminate in the Orbit of the Eye, and gives Paſſage to the Firſt Branch of the Nerve of the Third Conjugation. It has alſo Four Proceſſes, the Two large Ones of which are plac'd in the great Angle, and the ſmall Ones in the leſſer Angle, of the Eye.

The Bones of the *Synciput*, call'd by ſome the Bones of the *Vertex*, becauſe it is ſeated in the Center of them, are ſituated in the Middle betwixt the *Os Frontis* and *Occiput*, and call'd by the *Greeks* the *Bregma*. There are Two of them of a quadrangular Figure, but ſo as to make an oblong Square, the lateral Lines being longer than the tranſverſe, and that not upon a plain, but conver,

ing adapted to the *Sphærical* Figure of the Head. They are articulated at their anterior Extremities with the *Os Frontis*, by the *Sutura Coronalis*; at their posterior to the *Occiput*, by the *Sutura Lambdiformis*; on their interior lateral Parts one with another, by the *Sagittalis*; but on their exterior with the *Ossa Temporum*, where they degenerate into Scales. They are, beyond Dispute, the largest among all the Bones of the Skull; but at the same time the thinnest also, and weakest, for they are the last that harden, and turn into an osseous Substance in Children. They are every where of an equal Thickness, excepting at those Extremities where they degenerate into Scales. Their external Surface is exceeding smooth, but the interior somewhat unequal, because the *Jugular* Veins, that are dispersed through the *Meninges* of the Brain, have made here certain Tracts or Impressions upon them; which ought to serve as a Caution to Chirurgeons, to take Care that in the Terebrations of the *Cranium* they may not wound these Veins.

The Bone of the *Occiput* is situated on the hindermost Part of the Head: Its Figure resembles a Pentagon; for the First and Second *Latera* are where it is articulated with the Bones of the *Synciput* by the *Sutura Lambdoides*; the Third and Fourth where it is conjoin'd with the *Ossa Temporum* by the Additaments of the *Lambdoides*, or by the Third spurious Suture; and the Fifth where it is articulated with the *Os Cuneiforme*. Its Substance is very hard, and reputed to be the thickest among all the Bones belonging to the Skull: However, it is not thick alike in all its Parts; for in its superior Part it is very thick, where it has also a double *Lamina*; but at the inferior Part, where it approaches nearest to the *Basis* of the Skull, it is much thinner, and has but one single *Lamina*. In new-born Infants it consists of Three Bones; but in Adults but of One. Its *internal* Surface is smooth, excepting in those Parts where it has certain semicircular *Sinus's*; the Two *superior* of which are pretty large, for the Conveniency of those Muscles, as well which extend the Head, as for those that move the *Scapula* towards the Back, which we will call the *Cucullares*: But the Two *Inferior* are small, and almost of a circular Figure, design'd for the *Musculi Recti* that extend the Head. The interior Surface is very unequal by reason of the various *Sinus's* that are to be observed there. Two of these run transversedly quite through the Bone to the Sides of the *Ossa Temporum*, being plac'd near the First and Second *Sinus* of the *Dura Mater*. One of these stretches directly through the whole Head to the uppermost Point of the Nose, and makes the Third *Sinus* of the same Membrane. Above these are Two others, which are round; and underneath are Two more. The First of these receive the Prominencies of the *Cerebrum*, (being divided into Two) and the latter, being the largest, the Protuberancies of the *Cerebellum*. The Bone of the *Occiput* has Two *Heads* or Appendages, situated at its *Basis*, which are articulated with the First *Vertebra* of the Neck, and serve for the Motion, to wit, the Extension and Flexion of the Head. It has One *Foramen*, or Hole, which is very large, almost round, and situated at its *Basis* betwixt the beforesaid Two small *Heads* or *Appendages*; through which the Spinal Marrow descends from the *Cranium* to the Back. Adjacent to this are the Second and Third, which are oblong, and pretty large, betwixt the said Heads and the *Processus Styloides*; through which ascend from below a large Branch of the internal Jugular Vein, and a less Branch of the *Arteria Carotides*, and enter into the *Cranium*. And here also descends, and takes its Course out of the Skull, the whole Sixth Pair of Nerves. Not far from these are Two other round *Foramina*, or Holes, (to wit, the Fourth and Fifth,) but are scarce the Sixth Part so big as the former, which give Passage to the Seventh Pair of Nerves.

The Bones of the *Tempora* are plac'd on the Sides of the *Ossa Syncipitis*, on each Side One. They are the smallest among all the Bones of the Skull, and of a very irregular Figure; for in the superior Part they approach to that of a Semicircle; but on the inferior Part they are very uneven, sometimes jetting out into Processes, sometimes bending inward into Holes or Cavities. On the superior Part, where they are circular, they are articulated with the exterior lateral Parts of the Bones of the *Synciput*, by Means of the *Sutura Squamosa*; at the anterior Part with the First Bone of the su-

perior *Maxilla* by its First Process; on the Posterior Part with the Bone of the *Occiput*, by the Third spurious Suture. They have a very hard Substance, which is nevertheless very thin on the superior and circular Part, and destitute of that double *Lamina* which we told you the other Bones of the Skull have; but on the inferior Part near the *Basis* of the *Cranium*, it is so hard, that it is almost like unto a Stone; whence the whole Bone has obtained the Name of *Petrosum*. They have Two *Sinus's*: The *First* is situated betwixt the *Processus Mammillaris* and another which forms the *Os Jugale*. It is large, round, and pretty long; but grows smaller and narrower inwardly, and is incrustated with a Cartilage. The *Latins* call it the *Meatus Auditorius*, through which the Sound is convey'd into the *interior Ear*. The *Second* is adjacent to the former, and placed at the *Basis* of the *Cranium*, under the First Process which forms the *Os Jugale*. It lies transversedly, being oblong, and invested with a Cartilage, and receives the small Head of the inferior *Maxilla*.

The *Ossa Temporum* have also divers *Foramina*, or Holes. The *First* is on the interior Part of the Skull in the *Processus Petrosus*, of an oval Figure, and stretching by a long Tract into the Bone as far as the Labyrinth. It gives Passage to the Auditory Nerve, of the Fifth Conjugation. The *Second* is pretty large and unequal, stretching obliquely forward, being situated under the *Appendix Styloides*. Through this the larger Branch of the *Arteria Carotides* is carried to the Fifth *Foramen* of the *Os Cuneiforme*, and from thence goes to the Brain. The *Third* is betwixt the *Os Occipitis* and *Temporis*, being common to both. It is large and unequal. It gives Entrance to the Jugular Vein, and to the *Arteria Carotides*, and an Egress to the Nerve of the Sixth Pair. The *Fourth* being seated betwixt the *Processus Mammillaris* and the *Appendix Styloides*, terminates in an oblong Chanel, and gives an Inlet to the *Arteria Carotides*. The *Fifth* is situated behind the *Processus Mammillaris*, at the transverse Side of the *Sutura Lambdoides*. It gives Entrance to the First Branch of the external Jugular Vein, which goes to the *Cranium*. This is absent sometimes in one, sometimes in both Sides.

They have *Four Processes*: The First begins at the *Meatus Auditorius*, or the anterior Part of the *Sinus* of the Head of the inferior *Maxilla*, and stretching forward from a broad *Basis*; and concurring with the Process of the First Bone of the superior *Maxilla*, is conjoin'd by an obliqne Suture, and forms the *Os Jugale*. The *Second* arising from a broad *Basis* at the posterior Part of the *Ossa Temporum*, and the Bottom of the Head, terminates in an obtuse Angle or Head, resembling by its oblong Figure to the Dugs of a Cow; whence it has obtain'd the Name of *Mastoides*, or *Mammillaris*. The *Third* is sharp and long, being situated betwixt the Second *Sinus* and the just now mentioned Process. It is called *Styloides* because it resembles unto a Style, such a one as we use for Writing. The *Fourth* is on the interior Part, being very hard, and is call'd the *Os Petrosum*, within which is contained the triple Cavity of the internal Ear: Of which more hereafter.

CHAP. III.

Contains a Description of the Three small Bones that are subservient to Hearing.

IN the First Cavity of the Ear, call'd the *Concha* by the Anatomists, are to be observed Three Bones, framed by an almost miraculous Contrivance of Nature. 'Tis no Wonder that these Bones were unknown to the Ancients, not only by reason of their Smallness, which is such as may easily escape the Eye, but also because they lie concealed in

in the *Os Petroſum*; notwithſtanding which they could not eſcape the indefatigable Scrutiny and Diſcovery of the more modern Anatomiſts. And in this Reſpect, the Learned World ſtands indebted to *John Carpus*, of *Bologna*, for the Firſt Diſcovery of the Two Bones call'd the *Incus* and the *Malleolus*; as *John Philip Ingraſſia* moſt deſervedly challenges the Honour of being the Firſt Diſcoverer of the *Third*, which is call'd the *Stapes*: For there are only Three of theſe ſmall Bones which have obtain'd their Denominations rather from their Figure than from their Uſe; for they are call'd the *Malleus*, or Hammer; the *Incus*, or *Anvil*; and the *Stapes*, or Stirrop. They are of a very thick and hard Subſtance, and have alſo their Cavities, which contain the Marrow. Their Magnitude is the ſame in new-born Children as in adult Perſons; nor is there any other Difference betwixt them, excepting it be in their Solidity, becauſe in the ſame Manner as all the other infantile Bones are ſofuſh, ſo theſe ſmall Bones alſo are not as yet arrived to their full Degree of Solidity. They have alſo no *Perioſteum*; which ſeems to be done by a peculiar Providence of Nature, leſt they ſhould have been render'd unfit to receive the *Sound*; for a hard Body, if it be cover'd with a ſoft Subſtance, loſes its Sound, as if a Piece of Cloth ſhould be laid or plac'd on a Bell.

The *Malleus*, or Hammer, which is the Firſt of theſe Three ſmall Bones, is ſituated at the *Tympanum*, or that Membrane which is expanded to the Firſt Cavity, at the Extremity of the *Meatus Auditorius*. It has a ſmall thickiſh and oblong Head, adhering to a ſlender Neck, and having a ſlight *Sinus* for its Articulation with the Second of theſe ſmall Bones, call'd the *Incus*. It has Two Proceſſes ariſing from the Neck, to the ſuperior of which, being alſo the leſſer of the Two, and ſomewhat incurvated, is adherent the *Chorda*, that is extended under the *Tympanum*; and the inferior is cover'd all over with a Membrane.

The *Second* is the *Incus*, or Anvil, which is plac'd next to the *Malleus*, and provided with a Head, and Two Divarications or Legs. It has a pretty thick Head, in the uppermoſt Point of which is a ſlender Cavity, that receives the Protuberancy of the *Malleus*. One of its Two Legs, to wit, the ſlendereſt and longeſt, is tied to the Head of the *Stapes*; and the other, which is the ſhorteſt, thickeſt, and the broadeſt, reſts upon the *Os Squamoſum* of the *Tempora*.

The *Third* of theſe ſmall Bones is the *Stapes*, or Stirrop; ſo call'd from its Reſemblance to a Stirrop. Its Situation is as it were in the Middle of the Firſt Cavity, at the *Foramen Ovale*. It is made in Form of an Arch, terminating in Two very ſmall Divarications or Branches, ſet upon a flat *Baſis*. On its ſuperior Part it has a very ſmall round Head, and an intermediate Arch as it were; upon which reſts the longeſt Leg or Proceſs of the *Incus*. The *Baſis* ſtands at the *Foramen Ovale*, and the Membrane that cloſes it up. Concerning the Cavity that is in the *Os Petroſum*, we ſhall treat more at large when we come to the Organs of Hearing.

CHAP. IV.

Of the Os Cuneiforme, *and* Spongioſum.

WE have given you an Account hitherto of the Bones that belong properly to the Skull; and therefore it is Time we ſhould come to thoſe alſo it has in common with the ſuperior *Maxilla*, to wit, the *Os Cuneiforme*, and the *Spongioſum*.

The *Os Cuneiforme* has obtained its Denomination not from its Figure, but from its Poſition, becauſe it is fix'd like a Wedge in the Middle not only of the Bones of the Skull, but alſo of the ſuperior *Maxilla*; whence the *Greeks* have alſo call'd it the

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Os Sphænoides. 'Tis alſo call'd the *Multiforme* by ſome, from the various Figures of thoſe different Bones of which it conſiſts; which alſo have borrowed their Names from their own particular Figures.

On its anterior Part it is conjoin'd with the *Os Frontis* by the Fifth *ſpurious Suture.* On its poſterior Part to the *Occiput*, by the Fourth Suture. On the lateral Parts it extends for a conſiderable Tract along the *Os Petroſum* of the *Tempora*, being ſeparated from it by an uneven Cleft. On its ſuperior Part it touches the Firſt, Fourth, and Sixth Bone of the ſuperior *Maxilla*; and on its inferior Part the Bones of the Palate, by the *Proceſſus Aliformes.*

This Bone differs in its Subſtance according to its various Compoſition: For in its lateral Parts near the *Tempora* it is but ſlender, but very ſtrong and ſolid; but in its middle Part where it makes the *Baſis* of the Head, it is very thick; nay, the thickeſt of all the Bones belonging to the Head, but not very ſolid; but forming a Cavity, not unlike to thoſe Two Cavities which we told you are formed in the uppermoſt Part of the Eye-brows, at the Beginning of the Noſe, and the *Baſis* of the *Frons*; which was done to prevent its being too weighty and burthenſome to the Head.

It has certain Proceſſes, as well in the *internal* as the *external* Part of the Skull. In the *internal* Part of the Skull it has Two Proceſſes on its anterior Part, beginning at a broad *Baſis*, and ending in a ſharp Point; as alſo Two more Proceſſes at its poſterior Part, being almoſt four-ſquare, and having their Protuberancies for the moſt Part at the Sides. Unto theſe, becauſe they encloſe the thick Part of this Bone, which is not unlike a Saddle, they have given the Name of the *Sella Equina.*

On the exterior Part of the Skull it has alſo its Proceſſes, to wit, on its anterior Part on each Side One, juſt at the Sides of the Holes which terminate in the Cavity of the Noſe. Theſe are call'd *Pterigoides*, or *Aliformes*, from their Reſemblance to the Wings of Bats: And on its poſterior Part Two more, which have their Riſe from the former, and ſtretch with their Two Protuberancies towards the *Proceſſus Styloides*; the anterior of them being ſmall and blunt, and the poſterior long and ſharp.

This Bone is provided alſo with ſeveral *Sinus's.* In the Middle of the *Sella* is One which is ſquare and broad, containing the *Pituitary Gland*, as it is call'd, through which the mucous Excrements that fall down from the Brain are tranſmitted. From this ariſe Four others, of an oblong Figure, which diſcharge the *Pituita* from the *Glandula* to the inferior Parts. Two others, being the *anterior* Ones, are ſeated at the Second *Foramen*, which is at the Root of the Orbit of the Eye; through which the *Nervi Motorii* enter the Orbit, which convey the *Pituita* to the Fat of the Eye, for the better Humectation of the Muſcles; from whence it is afterward carried to the Noſe, by the Means of the *Glandula* which is ſituated in the greater Angle of the Eye. Two others, which are the *poſterior* Ones, are extended to that unequal and rugged *Foramen* which is the Fifth of the *Os Sphænoides*, through which the *Pituita* is chiefly diſcharged into the Mouth and Palate. There is alſo a very conſiderable deep and long *Sinus* in the *Proceſſus Aliformes*, which ſerves for the ſtrengthening of the Muſcles that lie concealed in the Mouth.

This Bone is provided alſo with many *Foramina*, or Holes. The *Firſt* whereof, which is near the anterior Proceſſes that form the *Sella*, is circular, for the Entrance of the Optick Nerves into the Orbit of the Eyes. The *Second* is plac'd juſt underneath the Firſt; and being round on its inferior Part, ſoon after riſes upwards, and forms a long Cleft, which gives Paſſage to the Nerves of the Second Pair, deſign'd for the Motion of the Eye; as alſo to the Third Pair of Nerves of the Brain. Through the ſame *Foramen* a very remarkable Branch of the *Arteria Carotides* takes its Courſe to the Eyes; as alſo the *Pituita*, and the Humours of the Brain, collected in the *Glandula*, which produce what we call the Tears. Through its ſuperior Part a Vein which comes from the Orbit of the Eye, is diſpers'd through the thick Membrane of the Brain. The *Third* is at the exterior Side of the beforeſaid *Foramen.* It is but ſmall, but exactly round. Through this the Firſt Branch of the Fourth Pair of Nerves

Nerves goes to the Temporal Muſcles, and to thoſe that are within the Mouth. The *Fourth* has its Poſition on the exterior Side of the Orbit of the Eye, being very large and oblong, reſembling rather to a Cleft than a Hole. It is broader on its anterior Part, and narrower on the poſterior toward the Root of the Eye. Through this the Fourth Branch of the Third Pair, and the Firſt of the Fourth Pair, of the Nerves of the Brain, are diſperſed through the Temporal Muſcles, and the *Pituita*, which has its Ingreſs into the Orbit of the Eye through the Second *Foramen*, is carried to the Throat. The *Fifth* is a long and unequal Hole, about the Extremity of the poſterior *Sinus* of the *Sella*, through which the great Branch of the *Arteria Carotides* aſcends into the Head. The *Sixth* is plac'd at the exterior Side of this laſt, being of an oblong, or rather an oval Figure. It gives Paſſage to the Fourth Pair of Nerves of the Brain. The *Seventh* is plac'd behind the poſterior Part of the beforeſaid, being very ſmall, and exactly round. It gives Paſſage to the ſecond and leſſer Branch of the internal Jugular Vein, which enters the Subſtance of the *Dura Mater*, and the Footſteps whereof are conſpicuous in the Bones of the *Synciput*.

The Second Bone which the Skull has in common with the ſuperior *Maxilla*, is call'd *Ethmoides*, or *Cribroſum*, from its having its Holes irregularly diſpos'd like a Sive; as alſo *Spongioſum*, from its Spongioſity. This Bone conſiſts of ſeveral others, which are different in their Subſtance, Figure, and Poſition.

The *Firſt* Part is a Bone repreſenting an oblong Quadrangle, from whence the whole has obtained its Name, being ſituated in the anterior and internal Part of the Skull, and perforated with tortuous Holes in the Nature of a Sive, and cover'd with a very thin Membrane, which is perforated alſo, and through which the Scent penetrates into the Brain. When theſe Perforations are obſtructed by the *Pituita* that is diſcharged upon it, it occaſions a Heavineſs in the Head; a Thing frequently to be met with in cold Countries in the Winter Seaſon.

The *Second* Part is an oblong Triangular Proceſs in the Middle of the former, having a ſharp Point at its ſuperior Part, of a very ſolid Subſtance, which divides the whole *Firſt* Part into Two, and is call'd the *Criſta Galli*, from its Reſemblance.

Directly oppoſite to this, on the inferior Part, is the *Third* Part of this Bone; which being a very thin but hard Bone, ſtretches upward to the olfactory *Foramina*, and downwards to the Noſe. It divides the whole Cavity of the Noſe, and the Organs of Smelling, into Two Parts, *viz.* the Right and the Left.

The *Fourth* Part is full of ſmall Caverns like a Sponge; whence the whole Bone has been call'd *Spongioſum*.

The Uſes of this Bone are various, according to the different Parts of which it is compoſed.

The *Firſt* Part affords a free Paſſage to the Air, impregnated with the Scent to the Brain; which that it might be done with all poſſible Safety, its Structure was made of many Anfractuoſities, to prevent the Brain from being impair'd by the cold Quality of the Air, which is now beforehand temperated in its Paſſage through this Bone. In Rheums and Defluctions it alſo gives Paſſage to the *Pituita*, and the Excrements of the Brain; though this is not done according to the regular Courſe of Nature, who did deſign this Paſſage rather for the Conveniency of Smelling, than for the Excrements of the Brain: But when there is a great Afflux of the *Pituita*, and the natural Paſſages are obſtructed, it will open its Way, and diſcharge it ſelf wherever it can.

The *Second* Part, call'd the *Criſta Galli*, is plac'd under the *Falx*, and affords a ſecure Receptacle to the Third *Sinus* of the *Dura Mater*. The *Third* ſerves for a Partition to the Noſe; and thus provides it with double Organs of Smelling. The *Fourth* and *Laſt* ſerves to receive and collect gradually the Excrements that fall down from the Brain, which elſe would diſcharge themſelves without Intermiſſion through the Noſtrils.

CHAP.

CHAP. V.

Treats of the Os Jugale.

THE *Os Jugale*, which is conjoin'd on both Sides with the lateral Parts of the ſuperior *Maxilla*, does not conſiſt of One, but of Two Bones; yet has no peculiar Circumſcription, like the reſt of the Bones of the Skull have, ſo as to be diſtinguiſh'd from the reſt; but is continuous with others, the Bones of which it conſiſts being the Proceſſes of other Bones, united with one another by the Means of a Suture: For One of theſe Proceſſes, to wit, the *Poſterior*, is a Proceſs of the *Os Temporum*, ſituated forward at the *Meatus Auditorius*; and the other, *viz.* the *Anterior*, is a Proceſs of the Firſt Bone of the ſuperior *Maxilla*, which forms the leſſer Angle of the Eye. Theſe Two *Apophyſes* are conjoin'd in the Middle by an oblique Suture, and thus form the *Os Jugale:* Whence it is evident, that the Poſition of this Bone is on each Side of the Face, betwixt the *Meatus Auditorius* and the Firſt Bone of the *Maxilla.* 'Tis broad, but very thin, and nevertheleſs hard; and would be very ſolid alſo, were it not provided with certain Medulliferous Caverns. It ſerves inſtead of a Fence and Support to the Tendon of the Temporal Muſcle, to ſecure its Paſſage to the Proceſs of the *Corone* of the inferior *Maxilla*, where it has its Inſertion. It ſerves alſo for a Support to ſome other Muſcles, but eſpecially to the Third Pair of the inferior *Maxilla*, call'd *Maſſeter.*

CHAP. VI.

Contains an Account of the Bones of the Face, *and of the* Superior *and* Inferior Maxilla.

THE *Face* is divided into the ſuperior and inferior *Maxilla*, or *Jaw.* The *ſuperior Maxilla* is call'd that bony Part of the Face which forms the inferior and lateral Parts of the Eyes, the bony Part of the Noſe, the Cheeks, the Palate, and the upper Row of the Teeth. It is of an oſſeous Subſtance, but not abſolutely hard and ſolid, being provided with certain Caverns like the Pumice-Stone, which contain a Marrow. It is alſo unequal, ſome of its Parts being thinner, others thicker; and conſequently differing in their Hardneſs and Solidity: For ſince it was requiſite that this Bone ſhould be of a different Subſtance, Nature has thought fit to make it a Compoſition of ſeveral Bones. Theſe are conjoin'd as well with one another, as with other adjacent Bones of the Skull, and the *Sphænoides*, rather by an *Harmonia* than by a Suture, if you look upon them on the exterior Side; but if on the interior, they are united rather by a Suture than by an *Harmonia*, as may moſt evidently be obſerved if you break them aſunder. Its Sutures or Connexions are of Two Sorts, *viz.* ſuch as it has in common with the Skull, of which there are Five, and have been treated of before, when we

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gave you an Account of the Sutures; or elſe ſuch as are peculiar to the Bones of the *Maxilla*, of which there are Nine in all.

The *Firſt* begins in the Middle of the inferior Part of the Orbit of the Eye, and extends it ſelf obliquely and almoſt circularly to the exterior Side of the *Os Mali*, and from thence through the Cavities of the Temples. The *Second* is in the Orbit it ſelf, to wit, in its anterior and internal lateral Part, being circular and oblong, and encloſing the whole Second Bone of the ſuperior *Maxilla*. The *Third* is alſo in the Orbit, and on the ſame Side, but on its inferior Part. It runs from the Second common Suture of the *Os Cuneiforme* directly to the anterior Part of the Face, and terminates at the ſaid Second Suture. The *Fourth* is on the Ridge of the Noſe, reaching from the Interſtice of the Eye-brows lengthways quite through the oſſeous Part of the Noſe, and dividing the Fifth Bone into Two. The *Fifth* being ſituated at the exterior Part of the Noſe, keeps Company with the *Fourth* in its whole Courſe, from the Third common Suture, ſtreight downwards all along the Fifth Bone, to the cartilaginous Part of the Noſe. The *Sixth* runs acroſs thro' the poſterior Part of the Palate; and the *Seventh* lengthways from the poſterior to the anterior Part of the Palate. The *Eighth* is in the interior Part of the Face, in the Cavity of the Noſe, and is common both to the *Septum* and to the Fifth Bone. The *Ninth* is common to the ſame *Septum*, and to the Fourth and Sixth Bone of the *Maxilla*.

Some of theſe Sutures are ſimple or ſingle, as the Fourth, the Sixth, the Seventh, Eighth, and Ninth; others are double, to wit, One on each Side, as the Firſt, the Second, Third and Fifth.

Concerning the Bones of which the Upper Jaw is compoſed, we compute Twelve, or Six Pairs of them; though ſome Anatomiſts have reduced their Number only to Eleven.

The *Firſt* is that which forms the exterior Angle of the Eye, and that round Protuberancy which is call'd by ſome the *Circle of the Face*, being very hard and ſolid. On its ſuperior Part it is conjoin'd with the exterior Proceſs of the *Os Frontis*, at the Tail of the Eye-brow, by the Firſt common Suture; and in its lower Part with the Fourth Bone of the *Maxilla*, by the Firſt proper Suture; on its poſterior Part with the *Os Sphænoides*, by the Second common Suture; and laſtly, by its Proceſs with the Proceſs of the *Os Temporum*, at the lateral Parts of the Head, where it forms the *Os Jugale*, by the Fourth common Suture.

The *Second* is plac'd in the greater and interior Angle of the Eye, being the ſmalleſt among all the Bones of the *Upper Jaw*, round, and thin like a Scale. Upon it reſts the *Caruncula Lacrymalis*: Near which it has alſo a pretty large *Foramen* on its inferior Part, which terminates in the Cavity of the Noſe, being deſign'd for the diſcharging of the mucous Excrements of the Brain, that are conveyed to the Fat of the Eye through the Noſtrils. Through the ſame *Foramen* alſo, the Third Branch of the Third Pair of Nerves of the Brain is tranſmitted into the Cavity of the Noſe, and the Membrane that inveſts it. On its ſuperior Part it is join'd with the *Os Frontis* by the Third common Suture; on its inferior and anterior Part with the Fourth Bone of the *Maxilla*; and on its poſterior with the next following.

The *Third* (Pair) is of a hard and ſolid Subſtance, but as thin as the Second; but it has abundance of ſmall Cavities or *Sinus's* within. It is of an oblong quadrangular Figure, and is conjoin'd with Four other Bones: On the ſuperior Part to the *Os Frontis*, by the Third common Suture; on its inferior Part to the Fourth Bone of the *Maxilla*, by the Third proper Suture; on its anterior Part with the Second Bone of the *Maxilla*, by the Second proper Suture; and on its poſterior Part with the *Os Cuneiforme*, by the Third common Suture.

The *Fourth* is the largeſt and moſt ſolid of all, but not the thickeſt, having on its Inſide abundance of medulliferous Caverns. It forms the greateſt Part of the Face, but eſpecially the upper Part of the Cheek; whence it is alſo call'd the *Os Malæ* by *Galen*. It alſo contains all the Teeth, the *Myſtax*, the *Foramina* of the Noſe, and, in ſhort, almoſt every Thing that belongs to the upper Part of the Face; and for this Reaſon has its Connexion with more Bones

than any other of the *Maxilla*. On its ſuperior Part, near the Noſe, with the *Os Frontis*, by a ſmall Tract, of the Third common Suture; on its inferior Part with the *Os Cuneiforme*, by the Second common Suture; on its anterior Part with the Second Bone in the interior Angle of the Eye, by the Second proper Suture; and on its poſterior Part with the Third Bone, by the Third proper Suture; as alſo with its Fellow, by the Seventh proper Suture.

It has alſo ſome very conſiderable *Foramina* or Holes, to wit, *Two* at the inferior Part of the Orbit of the Eye, one of them being in the Orbit it ſelf, the other without it; through which paſſes the Second Branch of the Third Pair of Nerves of the Brain to the Muſcles of the Face. Beſides theſe, it has *One* in the anterior Part of the Palate, and *Two* in the poſterior Part, where the Bone of the Palate is divided by the Seventh proper Suture. Through this *Foramen* paſſes a ſmall Vein and Artery from the Palate into the Cavity of the Noſe.

The *Fifth* of theſe Bones is of an oblong quadrangular Figure, very hard, but not very thick It forms, in Conjunction with its Fellow, the oſſeous Part of the Noſe. On its ſuperior Part it is annexed to the interior Proceſs of the *Os Frontis*, by a ſlender Portion of the Third common Suture; on its inferior Part it has no Suture, but only certain Inequalities, by which it is conjoin'd with the Cartilages of the Noſe; on its anterior Part it is united with its Fellow by the Fourth proper Suture; and on its poſterior Part by the Fifth.

The *Sixth*, in Conjunction with its Fellow, forms the Palate, and the poſterior Part of the Cavity of the Noſe. In its anterior Part it reſembles unto a Semicircle; but in its poſterior, almoſt to a ſtreight Line.

From whence it is evident what Bones they are, and how many of them, that compoſe the Orbit of the Eye; ſome of them belonging to the *Frons*, others to the *Os Sphænoides*, and others to the *Upper Jaw*. To the *Os Frontis* there belongs only One, which forms the ſuperior Part; One to the *Os Sphænoides*, whoſe Poſition is on the exterior, lateral, and poſterior Part; Four belong to the Upper Jaw, to wit, the Firſt, Second and Third, and Part of the Fourth. The Firſt forms the exterior lateral Part, with the *Os Sphænoides*; ſo that the Firſt makes the poſterior, and the latter the anterior Part. The Second and Third form the interior lateral Part; and the Fourth the inferior Part; ſo that the whole Orbit of the Eye conſiſts of Six Bones.

The *Second* Part belonging to the *Face* is the inferior *Maxilla*, or *Lower Jaw*, which in Men is ſhorter than in any other Animal, excepting the Ape. It is alſo of a round Figure only in Man, to add to the Majeſty and Handſomneſs of the Face. It has alſo this peculiar in Man, That whereas in moſt other Animals it conſiſts of Two Bones, articulated together by a *Symphyſis*, it is ſingle in Man, provided he be come to Age of Maturity: For in young Infants it is compos'd of Two Bones, and conjoin'd in the Middle of the Chin by a pretty ſpacious Cartilage; but in adult Perſons it unites ſo firmly, that it is not to be ſeparated even by Coction. It is moveable, for the Reception and Maſtication of the Aliments; for which Reaſon it is alſo, that it is articulated with the Upper Jaw in ſuch a Manner as is moſt adapted to a manifeſt Motion, (as ſhall be ſhewn hereafter) to make both the Jaws conſpire in their common Function. For the ſame Reaſon alſo it was made of a very hard Subſtance, yet not ſo as to be ſolid in all its Parts, which would have proved incommodious by its Weight; but interſperſed with medullary *Sinus's* and Cells. It is very thick likewiſe, for the Conveniency of the Teeth.

Its Figure reſembles to an Arch, except that at its poſterior Part it riſes upwards, and ſends forth Two Proceſſes (on each Side One) like Two Horns. The *anterior* is call'd the *Corone*, which from a broad *Baſis* riſes into a ſlender and ſmall Prominency, paſſes under the *Os Jugale*, and ſerves for the Inſertion of the ſtrong Tendon of the Firſt Muſcle of the inferior *Maxilla*, or the *Temporal*. The *poſterior* forms a ſmall tranſverſe and long Head, upon a very remarkable Neck, which being incruſtated with a Cartilage, is adapted to the Second *Sinus* of the *Os Temporum*. Beſides this Cartilage, there is another very ſmooth and ſoft Cartilage plac'd betwixt the Head and the *Sinus*, which here not only performs the Office of

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a Ligament, and contains the Proceſs within its *Sinus*, but alſo adds to the Lubrication of that Part, ſo as to render the Articulation very ſtrong, and fit for the Performance of this moſt neceſſary Function of Life.

It has Two *Foramina* or Holes (on each Side One) on the interior Surface, at the Origin and Foundation of theſe beforeſaid Proceſſes, which penetrating through the Bones by a long Tract to the anterior Part, terminate in the *Foramina* of the exterior *Superficies*. Through theſe, the Third Branch of the Fourth Pair of Nerves of the Brain, as alſo a ſmall Vein and Artery, are convey'd to the Cavities of the Teeth. This Duct is eaſie to be diſcover'd in a dry'd Jaw-Bone, if you put a Braſs Wire into the *Foramina*. There are Two other Holes in the anterior Part of the external Surface, through which the beforeſaid Veſſels take their Paſſage to the Muſcles, the Lip, and the Skin plac'd thereabouts.

There are alſo certain Inequalities or Prominencies in the *Maxilla*, deſign'd for the Originations and Inſertions of the Muſcles. The *Firſt* is in the anterior and exterior Part of the Bone under the Chin, where it has a Protuberancy on both Sides, for the Heads of the Third Pair of the Muſcles of the Lips, which we will call the *Deprimens* of the inferior Lip. The *Second* is in the ſame anterior, but in the interior Part, being a ſlender Prominency, for the Inſertion of the Tendon of the Second Pair, call'd the *Deprimens* of the *Maxilla*. The *Third* is on the interior Side, towards the Extremity under the Head of the *Maxilla*, near the *Sinus* through which the Nerve has its Ingreſs with the other Veſſels; which was deſign'd for the Security and Inſertion of the Tendon of the Fifth proper Pair, which we will call the *Adductor* of the *Maxilla*.

Beſides theſe juſt now mention'd *Foramina*, there are certain Cavities at the Edges of both the Jaws, which are commonly call'd the *Alveoli*, or Sockets, being made for the containing of the Teeth, unto which they are exactly adapted and correſpondent both in their Number and Figure: For there are juſt as many Cavities as there are Teeth; ſo that each Tooth at its Eruption ſeems to frame its own peculiar Socket; and when it is loſt, its Cavity is loſt alſo, ſo as not to leave as much as a Mark of its Cavity behind it; till the ſame being ſucceeded by another Tooth, the ſame alſo forms its own Receptacle and Lodging-place, ſuch a one as is in all Reſpect correſpondent to its Poſition and Figure.

CHAP. VII.

Contains the Number and Hiſtory of the Teeth.

THE Teeth (as we told you) are fix'd in the *Alveoli* of the Edges of both the Jaws, being articulated in a peculiar Manner, call'd by the *Greeks Gomphoſis*, *i. e. Conclavatio*, becauſe they are wedged into the Jaws like Nails or Pegs; though in reference of their different Connexions, they ſeem alſo to make various Kinds of Articulations: For in reſpect of the Nerve which is inſerted into them, and keeps them ſteady, they ſeem to have their Connexion by a *Syneuroſis*; but in regard to the Gums, by which they are as it were fenced in, they ſeem to be united by a *Syſarcoſis*. And here it is to be obſerved, (which I have often found by Experience) That the Roots of the Teeth, and eſpecially thoſe of the *Inciſores* and *Canini*, which are fix'd within the *Alveoli*, are ſometimes bent and ſharp, and inſerted very deep within the Sockets; which as it contributes not a little to the Strength of their Articulations, ſo on the other Hand it renders them very difficult and dangerous to be drawn.

They have a very hard and ſolid Subſtance, exceeding all the other Bones; ſo

that they will for a very long Time reſiſt the Violence of the Flames. This Hardneſs was requiſite to preſerve them from being ſubject to Attrition in the Manducation of the Aliments; notwithſtanding which they will loſe ſomething of their Subſtance by conſtant Uſe, as is apparent in thoſe that have loſt a Tooth, where the Tooth that is oppoſite to it will always appear ſomething longer than the reſt, for no other Reaſon but becauſe it is not ſo much ſubject to Attrition, being deſtitute of its oppoſite Fellow.

As to their Figure, they bear ſome Reſemblance to a Nail, being ſomewhat broad and round in that Part that ſtands without the *Alveoli*, and long and ſharp where they are fix'd within them. They are however not all of them of the ſame Figure, but vary according to the Uſes for which they are deſign'd; as we ſhall ſee hereafter.

They have alſo each of them a very remarkable and conſpicuous Cavity on the interior Side, near the Root, which is inveſted with a certain Subſtance, not unlike unto a Membrane, which being to them in lieu of the *Perioſteum*, imparts a very exquiſite Senſe to the Teeth. This Cavity is different as to its Magnitude, not only in reſpect of the Teeth themſelves, as they are either bigger or ſmaller, but alſo in reference to the Age; for in Children, till they arrive to the Seventh Year of Age, this Cavity is pretty large, and inveſted with a certain ſcaly Subſtance not unlike a Honeycomb, and repleniſh'd with a certain white mucous Humour; whereas in adult Perſons this Humour being dried up, the Cavity cloſes up as it were into a narrow Hole.

They are provided with Veſſels of all Sorts, Veins, Arteries, and Nerves, by the Means of which they receive Nouriſhment, Life, and Senſation; they being of a moſt exquiſite Senſe, almoſt beyond any other Parts of the Body, it is requiſite that they ſhould be ſupplied with Nouriſhment, becauſe they are conſtantly worn away by Attrition; that they ſhould have Life, to be qualified for Nutrition; and to be capable of Senſation, that they might be able to avoid what is noxious, they being expoſed to external Injuries by their Poſition. They are impaired by what we call the Firſt Qualities, by Heat and Cold, and therefore theſe are almoſt the only that fall within their Senſation: For they receive no Detriment from hard Bodies: They bear without any Harm the File; but are ſtupified by the Cold, and put into violent Pains by Heat: For the Teeth having no other Senſe but what is communicated to them by the Membrane, which is plac'd very deep in their interior Parts, and all the hard Things, ſuch as Iron, the File, *&c.* not penetrating to this Membrane, they cannot be offenſive to them; whereas the Heat and Cold penetrating to the Membrane it ſelf, the Effects thereof are ſoon perceived there.

Their *Veins* they have from the *Jugulars*, their *Arteries* from the *Carotides*, their *ſoft Nerves* from the Third Pair of Nerves of the Brain; ſo that it is no Wonder that at the Firſt Eruption of the Teeth, our Bodies feel the Effects thereof by Fevers, Convulſions, *&c.*

The Surface of the Teeth is white, bright, and ſmooth; I mean in their proper natural State.

The Teeth are of a moderate Magnitude, yet ſo as not to be all alike; for the *Inciſores* are the leaſt, the *Canini* ſomething larger, and the *Molares* the biggeſt of all. Their Number amounts moſt commonly to Sixteen in each Jaw, which however is not always the ſame: This Diverſity ariſes from the *Molares*, of which there are ſometimes more, ſometimes leſs. They are diſtinguiſh'd into Three Sorts, to wit, into the *Inciſores*, *Canini*, and *Molares*.

Of the *Inciſores*, or *Cutters*, there are Four in each Jaw in the anterior Part. Their Uſe is to cut aſunder the Aliments, and prepare them for a further Comminution by the *Molares*. Of the *Canini*, or *Dog-Teeth*, there are Two, One on each Side of the *Inciſores*, unto whom they very much reſemble in their Figure, excepting that they are ſomewhat longer than the other Teeth, and much ſharper at their Extremities. Their Function is to be aſſiſtant to the *Inciſores*, in order to break aſunder ſuch Things as being of a very hard Subſtance, could not be cut aſunder by them. They are alſo call'd the *Eye-Teeth* by ſome, becauſe Part of the Nerves deſign'd for the Motion of the Eye are inſerted here. They have ſingle Roots, ſuch as the *Inciſores* have, but are ſtronger, and fix'd deeper into the Gums.

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The *Molares*, or *Grinders*, are ſo call'd becauſe they grind the Aliments in the Nature of a Mill-Stone. They are the laſt of all. Their compleat Number is Five, on each Side of the *Canini*; ſo that in the whole they make Twenty in both the Jaws: But their Number differs according to the Age; for young People have ſeldom above Four of 'em on each Side, and thoſe next to the *Canini*; the Two laſt belonging more properly to adult Perſons; whence they are call'd the *Dentes Sapientiæ*, or the *Teeth of Wiſdom*: And this is the Reaſon why the Authors do vary ſometimes in relation to the exact Number of the Teeth.

Their Figure is ſomewhat different from the other Teeth; for whereas they are ſharp-edged, theſe have a broad and unequal Surface, conſiſting of Four acute Prominencies; from the Conjunction of which there ariſes a ſmall Pit in the midſt of them; ſo that that Part of them which ſtands out beyond the Gums is almoſt ſquare, eſpecially in the Three laſt. Their Roots are not ſingle, like thoſe of the other Teeth, but double and triple; for they alſo vary in this Point both in reſpect to one another, and to the Jaw in which they are plac'd. In reſpect to one another, becauſe thoſe that are next to the *Canini* have fewer, the Three poſterior more: In reference to the Jaw, becauſe the Two next to the *Canini* in the Upper Jaw have Two, but the Three laſt Three Roots; as the Two Firſt of the Under Jaw have only a ſingle, and the Three others a double Root. The Teeth of the Upper Jaw have alſo larger Roots than thoſe of the Under Jaw; which ſeems to be done not without good Reaſon by provident Nature, ſince thoſe that were to be pendulous required a greater Strength to maintain themſelves in their natural Poſition.

Hence it is evident what Uſes the Teeth are deſig'd for, to wit, by Maſtication to prepare the Aliments for the Stomach, that they might be the eaſier converted into Chile; for the *Inciſores* divide or cut them aſunder, the *Canini* break what is too hard for the Firſt, and the *Molares* grind them into ſmall Particles like a Mill; for which Reaſon they were made both broad and ſharp, that they might both receive and retain; as alſo to grind the Aliments the better; juſt as we ſee the Mill-Stones made rough and unequal by the Help of Iron Inſtruments, becauſe a ſmooth Surface would not anſwer the Intention of grinding the Corn.

CHAP. VIII.

Contains an Account of the Os Hyoides.

UNderneath the inferior *Maxilla*, on the ſuperior Part of the *Larynx*, is ſituated a Bone, call'd *Ypſiloides*, and by Contraction *Hyoides*, from its Reſemblance to the *Greek* U, or *Lambdoides*, from its Reſemblance to the Λ: But in my Opinion its Figure approaches nearer to that of the Under Jaw, being ſinuous on its anterior Part, and having on its poſterior Two Horns, like long Proceſſes. Though this Bone has got the Denomination of a ſingle Bone, it conſiſts of divers others, and for the moſt Part, in Men of an advanced Age, of no leſs than Eleven; but in Women, of not quite ſo many, and ſometimes of no more than Three.

The Firſt of theſe Bones, which is plac'd in the Middle betwixt Two lateral ones, and is much larger and broader than they are, though ſomewhat ſhorter, is convex on its exterior or anterior Part, and terminates in an obtuſe Angle, but concave on its interior Side. It has ſeveral *Sinus's*, *One* on its ſuperior Part, which is tranſverſe and flat, for the Reception of the *Firſt Pair* of Muſcles belonging to it, call'd the *Attollens*; and *Two* more on its inferior Part, on each Side One, into which is inſerted the

Second

Second Pair, call'd the *Detrahens*. This we ſhall call the *Baſis* of the *Os Hyoides* hereafter, in the Hiſtory of the Muſcles.

Out of the lateral Parts of this Firſt Bone ariſe Two other Bones, to wit, the *Second* and the *Third*, which we ſhall call the *Inferior Latera* of the *Os Hyoides* (call'd by others the *Cornua*, or *Horns*). They are conjoin'd by the Means of a Cartilage, and of a broad cartilaginous Ligament. The *Os Hyoides* has alſo *Two* other *Proceſſes*, call'd the *Superior Latera*, becauſe they proceed from the ſuperior lateral Parts, which make the *Fourth* and *Fifth* Bone. They are round and ſlender. Unto theſe they add moſt commonly Three other ſmall Bones one each Side, which makes up the Number of Eleven.

Theſe Bones are conjoin'd with the adjacent Parts, to wit, with the Under Jaw, the *Sternum*, the *Scapulæ*, with the *Appendix Styloides*, the Tongue, the Cartilage *Thyroides* of the *Larynx*, and with the *Oeſophagus*. This Connexion is alſo not performed after One Manner, but partly by a *Syneuroſis*, partly by a *Syſarcoſis*; for the Firſt Bone is plac'd under the Tongue, whence it is call'd alſo the *Baſis* of the *Tongue*, which reſts upon its ſuperior Part; whereas the remaining Part of the Cavity of the *Hyoides* receives the *Epiglottis*. Its inferior Part, together with the Second and Third Bones, are all along annexed to the *Cartilago Scutiformis* of the *Larynx* by Four ſtrong Ligaments, which are tied at their Extremities to its Proceſſes. All the other Bones are alſo by certain Ligaments faſten'd to the *Appendix Styloides*. But in what Manner they have their Connexion with the *Sternum*, *Oeſophagus*, *&c.* by the Intervention of the Muſcles, we ſhall have Occaſion to relate more at large in the Hiſtory of the Muſcles. This Bone is ſubſervient in a great Meaſure to keep the Paſſage of the Throat in its due Form, whereby the Aliments are the more conveniently convey'd through the *Oeſophagus*, as alſo the Air is carried through the *Larynx* into the *Aſpera Arteria*.

CHAP. IX.

Gives an Account of the Claviculæ.

THE *Clavicles* are ſo call'd, not becauſe they lock up the *Thorax*, but becauſe they reſemble in their Figure to the ancient Keys of Houſes, which were made like the *ſ* of the *Latins*; for in that Part where they recede from the Bone of the *Sternum*, they are convex on the Outſide, but where they are join'd with the *Summus Humeris* they are incurvated and concave in the anterior Part. There are Two of theſe *Clavicles*, One on each Side. That Part which is towards the *Jugulum* is round, but the other Half towards the *Humerus* grows broad by degrees: The firſt affords an Origination to the Firſt Muſcle that moves the *Humerus*, call'd the *Pectoral*; and the latter an Origination to the Second, call'd the *Attollens*, and the *Deltoides*.

They are conjoin'd with Two Bones, to wit, with the *Sternum* and with the *Scapulæ*; with the *Sternum* by an oblong, flat, and almoſt triangular Head, and the *Sinus* of the ſuperior Part of the Firſt Bone of the *Sternum*, which is incruſtated with a Cartilage; but with the ſuperior Proceſs of the *Scapula*, or *Summus Humerus*, it is join'd by an oblong broad Head. The Head which is conjoin'd with the *Sternum* has not only a Cartilage, ſuch as is common to other Heads of the Bones, but is provided alſo beſides this with another, which is very thin and ſmooth, and altogether like that of the *Inferior Maxilla*, cover'd with an unctuous Humour. It has alſo its Ligaments, which ſurround the Articulation in the Nature of a Circle. For the reſt, the *Subſtance* of theſe

Bones

Bones is hollow or fiſtulous near the Heads, but not ſo much in the Middle. Their *Uſe* is to ſupport the *Scapulæ*, that they may not, together with the *Humerus*, fall forwards upon the Breaſt, as it happens in thoſe that have a Fracture in the *Clavicula*.

CHAP. X.

Contains the Hiſtory of the Sternum, *or the* Breaſt-Bone.

ON the anterior Part of the *Thorax* in Man there is a Bone, which differs very much from that which is correſpondent to it in other Animals, both in its Breadth and Shortneſs. 'Tis moſt commonly call'd the *Sternum*, and by ſome the *Os Xiphoides*, or *Enſiforme*, and by the *Latins* the *Os Pectoris*, or the Breaſt-Bone. It conſiſts of ſeveral other Bones, which are conjoin'd with one another by the Means of Cartilages. In Perſons of an advanced Age it is moſt commonly compoſed of Three, the *firſt* and *laſt* of which are always the ſame in Perſons of different Ages; but the Second is very different, forming ſometimes more, ſometimes fewer, and oftentimes but One Bone, according to the different Age of the Perſon. In new-born Children it conſiſts moſt frequently of Three Bones, which after they are Seven Years old grow together into One.

The Subſtance of theſe Bones is not ſolid, like that of other Bones, but red and ſpongious, and full of ſmall Caverns, incruſtated with a double teſtaceous Involucre, the anterior of which is much more ſolid than the poſterior. In young Infants it is abſolutely cartilaginous; but afterwards turns oſſeous, yet ſo as that the ſuperior Parts turn into Bone before the inferior.

Its Figure, if you take the Three Bones together, reſembles unto the Hilt of an old-faſhion'd Sword, which has a ſemicircular Guard; for the Firſt Bone being broad, reſembles to that Part which guards and lies under the Hand; the ſemicircular Part of the Second, to that Part of the Sword where we take hold of it; and the Third reſembles to the Pummel of the Sword.

The *Firſt* of theſe Three Bones is very thick, eſpecially on its ſuperior Part, being like a Triangle turn'd upſide down, the *Vertex* or Point whereof is cut off, excepting that the *Latera* or Sides are like a Creſcent on both Sides. The ſuperior Part has on each of its Extremities a long *Sinus*, incruſtated with a Cartilage, which receives the Head of the *Clavicula*, in the Middle of each of which is a ſemicircular Pit, which they call the *Jugulum*.

The *Second* Bone is not ſo thick nor ſo broad, but almoſt four times as long as the Firſt, provided with ſeveral *Sinus's*, in which are inſerted the cartilaginous Protuberancies of the Third, Fourth, Fifth, and Sixth Ribs.

The *Third* is the leaſt of the Three, both in reference of its Thickneſs and its Length; but exceeds in Breadth the Second, being conjoin'd with its inferior Part.

At the Extremity of this laſt Bone is plac'd an oblong Cartilage, which by the vulgar and ignorant Sort is call'd *Xiphoides*, or *Enſiformis*, and the *Mucronata*; for ſome who had made their Anatomical Diſſections upon Dogs, finding that their *Sternum* had not the leaſt Reſemblance to this Word, have of Courſe adapted it to this Cartilage; whereas thoſe that have not wanted an Opportunity of inſpecting the dead Carcaſſes of Men, are ſufficiently convinced that it belongs to the whole *Sternum*. This Cartilage is not always of the ſame Figure, being ſometimes forked, oftentimes round, but moſt frequently triangular.

Under this is to be obſerved a certain ſmall Cavity, call'd the *Scrobiculus Cordis*, or the *Pit of the Heart*, and *γαςρὶα* by the ancients.

cient *Greeks*, being the Place where the ſuperior and left Orifice of the Stomach is ſituated; whence the Pains that are felt in that Part are by the Practical Phyſicians call'd *Cardialgiæ*, or *Pains of the Heart.*

The Uſe of the *Sternum* is to ſerve for a Rampire to the *Thorax*, and for a firm Receptacle to the Ribs, which are articulated to it: For ſince it was requiſite that the Frame of the *Thorax* ſhould be made in Part of the Ribs, becauſe if it had been all bony as the Head, or altogether carneous as the Belly, it would have prevented its Motion, (a continued Bone being inflexible, and a carneous Subſtance inſtable) it was neceſſary there ſhould be a certain Part which might ſerve for their Articulation and Support.

CHAP. XI.

Contains an Account of the Scapulæ.

THE Bones of the *Scapulæ*, or Shoulder-Blades, call'd *Omoplatæ* by the *Greeks*, *i. e.* the Bones that form the Breadth of the Shoulder, are Two in Number, on each Side One. Their Poſition is on the Back, betwixt the Firſt and Fifth Rib of the *Thorax*, it being very rare to ſee them reach to the Sixth.

In lean People, ſuch as are ſubject to Conſumptions, they ſtand out like Wings; whence thoſe that have theſe Signs of a conſumptive Diſpoſition are call'd *Pterigoides*, or *Alati.*

Their Figure on the exterior Part is convex, for their greater Security; the interior is concave: The firſt we will call the *Dorſum*, or *Back* of the *Scapula*, and the laſt its *Cavity.* The whole *Scapula* reſembles in its Figure to the Triangle call'd *Scalenum* by the *Mathematicians*, having unequal *Latera*, or Sides, the Firſt being ſo much longer than the Second, as this is beyond the Third.

The Firſt *Latus* or Side of the *Scapula*, is that Part which is extended directly along the Back, next to the Spines of the *Vertebræ* of the *Thorax*, though it does not make an exact ſtreight Line, but inclines both on its inferior and ſuperior Part a little towards the exterior Part of the Body. The *Second Latus*, beginning at the inferior Part of the *Firſt*, ſtretches obliquely upwards; but the *Third* begins at its ſuperior Part, and in a ſtreight Line proceeds, as well as the Second, to the exterior Part of the Body, where both of them are join'd in the Nature of the *Vortex* of a Triangle, in that Proceſs which forms the ſinuous Neck for the Head of the *Humerus.* The Firſt *Latus* is call'd the *Baſis*, and the other Two the *Coſtæ*; and for Diſtinction-ſake, the Second is call'd the inferior *Coſta*, and the Third the ſuperior *Coſta.*

It has alſo Three Angles like the Geometrical Triangles; but Two of them are obſerv'd only by the Anatomiſts for the Sake of the Muſcles. One of theſe is call'd the upper Angle, being that which is circumſcribed by the *Baſis* and the ſuperior *Coſta*; the other the inferior Angle, which is made by the *Baſis* and the inferior *Coſta.*

In the Firſt of theſe Two, the *Muſculus Elevator Secundus Scapulæ* has its Inſertion; in the latter, the *Quartus Humeri Deprimens, ſive Rotundus*, has its Origination.

The *Scapula* has its Connection with ſeveral Parts by the Intervention of the Muſcles, and conſequently by a *Syſarcoſis*, to wit, with the Bone of the *Occiput*, with the *Vertebræ* of the Neck, of the Back, and with the Ribs.

With the Bones of the *Occiput*, by Means of the Muſcles call'd *Cucullares*, which alſo conjoin it with the *Vertebræ* of the Back: With the *Vertebræ* of the Neck, by the Second Pair of the ſame, call'd the *Elevantes*, which we will call the *Muſcles of Patience*: With the Back by the *Rhomboides*, or the Third Pair; and with the Ribs by the *Serratus Minor.*

It

Its Subſtance is hard and ſolid, excepting in ſome Parts, where it is ſpongious, and diſtinguiſh'd by many ſmall Caverns or Cells. The inferior *Coſta* is indifferent thick, the ſuperior thin: The *Baſis* is betwixt both; but in its ſuperior Part where the *Coſtæ* are conjoin'd it is very thick; what is betwixt theſe Parts is very thin.

It is provided with Three Proceſſes: The *Firſt* of which is very ſhort, and its Neck ſtill ſhorter. It terminates in a *Sinus*, which is ſomewhat ſharp on the ſuperior, but orbicular on the inferior Part. This *Sinus* receives the Head of the *Humerus*, but ſeems not to have a ſufficient Depth for it; which would have prov'd an Impediment to the various and ready Motions of the *Humerus*: But on the other Hand, to prevent a Diſlocation in this Part, provident Nature has provided againſt this Inconveniency, by ſtrong Ligaments and a peculiar Proceſs; but more particularly by adjoining another Cartilage to that which inveſts the *Sinus*; which being plac'd at its Circumference, does not grow together with the *Sinus*, but being faſten'd to it by Ligaments, begins with a thick Edge, but grows thinner by degrees as it approaches towards the Center. Thus, whereas the *Sinus* had not its full Depth before, this Defect is made good by this Cartilage, which does not give the leaſt Impediment to the neceſſary Circumvolutions here, becauſe the Cartilage being of a ſoft Subſtance, gives Way to the Head of the *Humerus*, a Thing very well worth Obſervation by young Chirurgeons, who ought to take Care not to impair or tear this Cartilage in the Reduction of this Joint, which ought therefore to be undertaken with all poſſible Gentleneſs.

The *Second* Proceſs is call'd the *Spine* of the *Scapula*, being very ſtrong, and ariſing almoſt from the whole Breadth of the Back, not in the Middle of its Length, but ſomewhat higher, and almoſt under the ſuperior Angle. This Proceſs beginning as it were with a narrow *Vertex* near the *Baſis* of the *Scapula*, as it proceeds forward, increaſes gradually in Breadth and Thickneſs; and as it approaches almoſt to the Neck, it recedes from the *Scapula*. It terminates in a long, ſomewhat broad, and moderately incurvated Appendage; which riſing upward above the *Humerus*, turns forward; and in its anterior Extremity has a ſuperficial *Sinus*, by which it is articulated with the Head of the *Clavicula*. This whole Proceſs, which is join'd to the *Dorſum* of the *Scapula*, is call'd the *Spine* of the *Scapula*; but that Part of the *Spine* which is carried above the *Humerus* is call'd the *Acromium* by the *Greeks*, and the *Summus Humerus* by the *Latins*; by which Name we ſhall mention it hereafter in the *Hiſtory of the Muſcles*. The *Spine* produces Two Cavities, a *ſuperior* and *inferior*, both of which are call'd the *Interſcapulium*, *ſcil. ſuperius* and *inferius*.

The *Third Proceſs* is that which ariſes from the *ſuperior Coſta*, where it is adjacent to the Neck, being both ſmaller than the beforeſaid, and plac'd alſo lower. Its Figure is almoſt ſemicircular, for it riſes from a narrow *Baſis* up into a ſharp Point by a circular Line. It is plac'd before the Joint of the *Humerus*, to keep it ſteady and firm in its Receptacle. It has obtained divers Names, from its Reſemblance to different Things; but moſt commonly it is call'd *Coracoides*, from its Reſemblance to the Beak of a Raven. We will call it by a *Latin* Denomination the *Ancoriformis*, from its Reſemblance to an Anchor.

Concerning their Uſe, 'tis eaſie to imagine that they were made for the Articulation of the *Humerus*; beſides that, they give Riſe to ſeveral Muſcles deſign'd for the Motion of the *Humerus*, and ſerve inſtead of a Shield to the Back, to defend it againſt external Injuries.

CHAP. XII.

Treats of the Spine *in General.*

THE *Spine* of the *Back* does not conſiſt of One ſingle Bone, though perhaps it might ſeem to have been the moſt proper for its Security, but is compoſed of many; by the Help of which the Body is capable of Extenſion and Flexion, and the ſeveral Branches of the Nerves are diſperſed from the Marrow, which it contains, almoſt through the whole Body. Theſe Bones are call'd by the *Latins* the *Vertebræ*, of which there are Twenty four, to wit, *Seven* belonging to the *Neck*, *Twelve* to the *Thorax*, and *Five* to the *Loins*. We call here that Part the *Back*, which beginning at the Firſt *Vertebra* of the Neck, reaches down to the *Os Sacrum*; though ſome Anatomiſts have comprehended the *Os Sacrum* alſo within the Back.

Theſe *Vertebræ* have certain Things that are common to them all without Exception; and they have other Things which are common only to the *Vertebræ* of the Neck, of the *Thorax*, and of the Loins; and ſome other Things they have that are peculiar. We will ſpeak in this Chapter only of what is common and general to them all, and treat hereafter of what belongs to them in particular.

All the *Vertebræ* that form the *Spine* (excepting the Firſt) have this in common with one another, That in their anterior Part they are provided with a Body, which jets out a little forward, or in that Part which is towards the Breaſt; but on its poſterior Part towards the Back it is hollow, and in its ſuperior and inferior Part has an equal Surface. This *Body* does not conſiſt of a ſolid and hard Bone, but is ſoft and ſpongious, reſembling in its Subſtance to that of a Pumice-Stone, and conſequently is very light.

As to the Magnitude of this Body, it is ſmaller (as well as the *Vertebræ* themſelves) than the ſuperior; ſo that the more remote any of them is from the Firſt of the Neck, the more it increaſes in Bulk: Whence it is, that the *Vertebræ* of the Loins are the biggeſt of all that belong to the *Spine*, becauſe that Body which is to ſuſtain another, ought to be bigger than that which is to be ſupported. But that the Body might not be over-burthen'd by their Weight, provident Nature has, by an ingenious Contrivance, made thoſe that are the biggeſt the leſs ponderous, by framing them of a very ſpongious Subſtance, full of ſmall Cells or Cavities; whereby it comes to paſs, that the *Vertebræ* of the Loins are very light.

Unto theſe Bodies are annexed Three Sorts of Proceſſes, to wit, the *tranſverſe*, *oblique*, and *acute*. The *tranſverſe* are call'd thoſe Proceſſes that are plac'd at the lateral Parts of the *Vertebræ*, One on each Side; the *oblique* Proceſſes are thoſe that have an oblique Poſition: Of theſe each *Vertebra* has Four, Two of which are call'd the *aſcending*, and the other Two the *deſcending* Proceſſes, deſign'd for the mutual Articulation of the *Vertebræ* with one another. In the midſt betwixt theſe is a Proceſs, which is pointed at its poſterior Part, owing its Riſe to the Concourſe of both of them; and ſtretching downwards on its ſuperior Part, proceeds in a ſharp Line, and on its inferior Part expands it ſelf into a broad *Baſis*.

Beſides theſe Proceſſes, each *Vertebra* has a pretty large *Foramen*, or Hole, betwixt the Body of the *Vertebra* and the Three Proceſſes, which affords a Paſſage to the Marrow, which deſcends from the *Cerebrum* through the whole Back. This is call'd the *proper Foramen*; for in their lateral Parts, where they are conjoin'd with one another, they are excavated; ſo that as they are join'd together, the Two Cavities of the *ſuperior* and *inferior* next adjacent *Vertebræ* form as it were

One

One round Hole, (call'd the common *Foramen* of the *Vertebræ*) which affords an Egreſs to a Nerve, and an Ingreſs to a Vein and Artery, into the Cavity of the *Spine*. Concerning the Manner of their Connexion, we ſhall ſpeak in the Third Book of the Ligaments.

CHAP. XIII.

Of the Vertebræ *of the* Neck.

THE Neck conſiſts of Seven *Vertebræ*, very rarely of Eight; which if it happens, there is One *Vertebra* wanting in the *Thorax*, which being thereby rendred ſhorter than ordinary, makes the Perſon ſubject to a Conſumption, becauſe the Lungs cannot have their due Motion. The Neck was made for the Sake of the Lungs, becauſe the Lungs contain the *Aſpera Arteria:* And it is obſervable, That thoſe Animals that are deſtitute of Lungs, have alſo no Neck; as thoſe that have Lungs, have alſo a Neck.

The *Vertebræ* of the Neck, beſides thoſe Things they have in common with all the other *Vertebræ* of the Back, (which we have ſpoken of in the preceding Chapter) have alſo certain Things in common with one another, and ſome other peculiar; of which we are to give an Account here.

As to their *Body*, they have this in common with one another, That it is not ſemicircular, as in thoſe of the *Thorax*, and of the Loins, but rather of an oblong quadrilateral Figure. The poſterior Part is plain, the ſuperior ſinuous; the inferior ſomewhat convex, the better to ſecure and ſtrengthen their Connexion, and to facilitate and quicken their Motion. As to their Magnitude, they being plac'd on the uppermoſt Part of the *Spine*, they are ſo much the ſmaller in reſpect of thoſe of the *Thorax*, as thoſe are in reſpect to thoſe of the Loins.

They conſiſt of a harder Bone than the reſt of the *Vertebræ*, partly becauſe they are continually in Motion, partly becauſe the reſt are more porous, becauſe they are larger, as has been ſhewn before. They have their *oblique*, *tranſverſe*, and *poſterior* Proceſſes; the laſt of which are bifid in all of them, excepting in the firſt and the Two laſt. They are alſo every one of them provided with Holes: *Firſt*, the *great* One, through which paſſes the Spinal Marrow; and *Two* more, on each Side One, in the tranſverſe Proceſſes, (a Thing obſervable only in the *Vertebræ* of the Neck) through which the Veins and Arteries aſcend into the Head: And laſtly, the *common Foramina*; concerning which, there is this Difference in the *Vertebræ* of the Neck, That the inferior *Vertebra* contributes always a bigger Cavity than the ſuperior, towards the making up of the ſaid *Foramen*.

The Firſt *Vertebra* of the Neck is ſmaller than all the reſt; but at the ſame time is alſo more hard and ſolid; for it was requiſite that it ſhould be very thin, to afford a larger Cavity for the Paſſage of the Marrow, which here is thicker than in the others, being the Place where it makes its Egreſs from the Brain. This is the only *Vertebra* that is deſtitute of a *Body*; in lieu of which it has a Protuberancy in its anterior Part, and a ſquare *Sinus* in its interior, which is incruſtated with a Cartilage, and receives the Dentiform, or Tooth-like Appendage, of the Second *Vertebra*, which is alſo inveſted with a Cartilage. Its Proceſſes, both *aſcending* and *deſcending*, are but little differing from the reſt, being both ſinuous, and the firſt receiving the Prominencies of the Head, as the latter do the aſcending Proceſſes of the Second *Vertebra*. Upon the Firſt is performed the Flexion and Extenſion of the Head; upon the latter the circular Motion about the *Proceſſus Dentiformis*, or the turning of the Head ſideways.

Their *tranſverſe* Proceſſes are plain, but larger than the reſt, which was neceſſary for the Sixth and Seventh Pair of the Muſcles that move the Head.

The *Spine*, or the poſterior Proceſs, does differ very much from all the others; for it is neither forked, as the reſt of the Neck are, nor pointed, as thoſe of the *Thorax*, but plain, terminating in a ſmall Prominency, and a very obtuſe Angle, and ſo very ſhort, as ſcarce to deſerve the Name of a Spine; for were there a compleat *Spine* here, it would prove very incommodious to the Muſcles that are plac'd hereabouts. It has a peculiar Hole in its Middle, being bigger than that of the others; but in its inferior Part it makes up the *common Foramen* with the Second *Vertebra*, as the Second does with the Third; yet not altogether in the ſame Manner as the reſt, but through the *Sinus*, which are almoſt like a Chink, near the oblique deſcending Proceſſes, by which it is conjoin'd with the aſcending Proceſſes of the Second *Vertebræ*. In all the reſt of the *Vertebræ* of the Neck, the *Sinus* that forms the *common Foramen* is of an orbicular Figure.

The Second *Vertebra* has indeed a Body, but it is cloſer and ſmaller than thoſe of the reſt. Its *tranſverſe* Proceſſes are leſs alſo, and ſo are the *Foramina*, which look downwards. The *poſterior* Proceſs is forked like the reſt; the *ſuperior* protuberates a little; and the *inferior* are ſomewhat *ſinuous*. But from the Middle of the Body, betwixt the Two *aſcending Proceſſes*, on the ſuperior Part, ariſes another, which is not common to any other of the *Vertebræ*, being pretty high, pointed, very ſolid, and inveſted with a Cartilage. It is inſerted into the *Sinus* of the Firſt *Vertebra*, upon which is perform'd the circular Motion of the Head. This Proceſs having ſome Reſemblance to a Dog's-Tooth, is call'd *Hippocrates*'s *Dens Magnus* by the Anatomiſts; though *Hippocrates* has given the Name of *Dens* rather to the whole *Vertebra*, than to its Proceſs. This Proceſs, on its ſuperior Part, where it riſes above the Firſt *Vertebra*, is ſomewhat unequal, for the greater Security of the Ligament, by Means whereof it is conjoin'd with the *Os Occipitis* at the anterior Part of the *great Foramen*, through which the Spinal Marrow deſcends from the Brain.

The Four next ſubjacent *Vertebræ*, to wit, the *Third*, *Fourth*, *Fifth*, and *Sixth*, are in all Reſpects alike to one another. They have all their lateral Proceſſes broader than the reſt, and bifid: Their *Spinæ* are forked alſo, for the ſtrengthening of the Connexion of the Muſcles: However, the Spine of the Sixth *Vertebra* is not ſo much forked as the reſt. Their *oblique* Proceſſes are alſo alike to one another; and the *Aſcendents* are provided with a ſlight Head or Protuberancy, which is ſo inconſiderable, that it is a hard Matter to ſee whether it be a *Head* or a *Sinus*: But the *deſcending* Proceſſes have an orbicular *Sinus*.

The *Seventh Vertebræ* is the largeſt among all thoſe that belong to the *Neck*; and as it is the next to the *Vertebræ* of the *Thorax* in its Poſition, ſo it comes next to them in its Figure; for neither its *tranſverſe* nor its *poſterior* Proceſſes are forked.

CHAP. XIV.

Of the Vertebræ *of the* Thorax, *and of the* Loins.

NEXT to the Seven *Vertebræ* of the *Neck*, the Twelve belonging to the *Thorax* have their Stations. Sometimes there are Thirteen, and as many Ribs belonging to them, but that very ſeldom; ſometimes alſo no more than Eleven, but that is very rarely ſeen.

The Bodies of theſe *Vertebræ* are orbicular on the anterior Part, and a little hollow in Form of a Creſcent on the poſterior Part. On

On the ſuperior and inferior Parts they have a ſmooth Surface, excepting the Firſt, the ſuperior Part of which is unequal, like that of the *Vertebræ* of the Neck. And though they are ſmooth, yet at the Edges they have all their Inequalities, for the ſtrengthening their Connexion with the Ligaments, to prevent the Diſlocations of the *Vertebræ*. They have alſo their Four *oblique* Proceſſes, Two *lateral*, and One *poſterior* on the *Spine*, like all the reſt of the *Vertebræ* of the Back. The Four *oblique* ſerve for the Articulation one with another, in ſuch a Manner, that the *ſuperior* aſcending Proceſſes have always the Office of a Head, and are inarticulated with the inferior of the next ſuperior *Vertebra*; as on the contrary, the *inferior* are excavated, to receive the Heads of the next ſubjacent *Vertebræ*. And this Articulation they have in common with the *Vertebræ* of the Neck; ſo that from the Second *Vertebra* of the Neck to the Eleventh of the *Thorax* their Articulation is the ſame: But the Twelfth has a peculiar Connexion; for as the Firſt *Vertebra* of the Neck has both the oblique Proceſſes, as well the *aſcending* as the *deſcending*, provided with *Sinus's* for the Reception of the ſmall Heads, to wit, of the Second *Vertebra* below, and of the *Occiput* above, ſo are the laſt *Vertebra* of the *Thorax* both of them provided with Heads, that above it may be received by the Eleventh of the *Thorax*, and below by the Firſt of the Loins.

Their *tranſverſe* Proceſſes have their Protuberancies like round Heads, and ſtretch upwards. The Nine ſuperior *Vertebræ* of the *Thorax* are all of the ſame Magnitude; but the Three inferior grow ſmaller by degrees.

They have all their *Spines*, but not of the ſame Magnitude and Figure; but they are plain, and not forked like thoſe of the Neck: For the *Spinæ* of the Nine ſuperior *Vertebræ* are very long, pointed above, and broad below, ſtretching obliquely downwards. Thoſe of the Three inferior are much ſhorter than the ſuperior, but are much thicker, and proceed on directly. This is more conſpicuous in the Two laſt, *viz.* the Eleventh and Twelfth, in which they are ſtretch'd in a more ſtreight Line, in the ſame Manner almoſt as the *Spinæ* of the *Vertebræ* of the Loins; yet not ſo exactly, but that One may perceive them to incline a little downwards, ſomewhat after the Manner of the others belonging to the *Thorax*.

They have alſo their *Foramina*, like all the reſt of the *Vertebræ* of the Back; *One proper*, which is very large, and in the Middle, deſign'd for the Paſſage of the Spinal Marrow; *Two common*, on each Side One, which are formed by the *Sinus's* that are betwixt the *Body* and the *oblique Proceſſes*; where it is obſervable, that both theſe *Sinus's* which make up this *Foramen*, as well in the ſuperior as in the inferior *Vertebræ* of the *Thorax*, are always alike, and exactly correſpondent to one another in their Magnitude.

They have, beſides theſe, ſeveral other Things which are *proper* and *peculiar* to them only: *Firſt*, Two *Sinus's*, One on each Side. It is very ſuperficial, and inveſted with a Cartilage, for the Inſertion of the Heads of the Ribs. This *Sinus* is common to one and the other *Vertebra*, (from the Firſt to the Ninth); ſo that each of the Two contributes its half Share, juſt as we told you before concerning the *common Foramina*, near which alſo theſe *Sinus's* have their Poſition. In the other Three inferior *Vertebræ* it is as it were engraven in the Body it ſelf towards its ſuperior Part. *Secondly*, there is another *Sinus* alſo, which is ſuperficial, and inveſted with a Cartilage like the former, being placed on the *tranſverſe* Proceſſes of the Nine ſuperior *Vertebræ*, in which the Ribs are articulated and fix'd. Whence it is, that they are longer than the Three inferior, and, as far as they receive the Ribs, require longer Proceſſes, which were fram'd for their Sake. However, the Poſition of theſe *Sinus's* is not the ſame in all of them; for in the Firſt *Vertebræ* they look ſomething downwards, in the Laſt or the Ninth a little upwards; and in the Middle *Vertebræ* they keep a *Medium* betwixt both.

The Five *Vertebræ* of the Loins are next ſubjacent to thoſe of the *Thorax*. They have an oblong ſemicircular *Body*, which exceeds thoſe of the ſuperior *Vertebræ* in Bulk, it being natural for the *Baſis* to be larger and ſtronger than what is to be plac'd upon it. Its Subſtance is ſpongious, full of ſmall Cavities like a Pumice-Stone; which

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was done, partly that it might not prove troubleſom to the Animal by its Ponderoſity, partly that the Veins which carry the Nutriment thither, might have a free Ingreſs and Egreſs.

Their *ſuperior* Proceſſes, as well as the *inferior*, are formed in a quite different or rather contrary Way to thoſe of the *Thorax*: For in thoſe, the *ſuperior* had their Heads, and the *inferior* their *Sinus's*; whereas in theſe, the *ſuperior* are provided with *Sinus's*, and the *inferior* with *Heads*. Both of them are of an oblong Figure, and ſo plain, that One may eaſily diſtinguiſh the Firſt to be the *Sinus's*, and the latter *Heads*.

The *tranſverſe* Proceſſes are ſlenderer, but longer, than the *Vertebræ* of the *Thorax*, excepting the Firſt and Fourth, which are the ſmalleſt of all: The Third is the longeſt, and the Fifth the thickeſt, of them all. They all proceed directly, excepting the Fifth, which from a broad beginning ends in an acute Angle, being ſomewhat incurvated, and in its Progreſs bent upwards, to avoid the *Oſſa Ilium*, that are near it.

The *poſterior Proceſſes* are very ſtrong, but ſomewhat ſhort, in reſpect to their Body, almoſt of an oblong quadrilateral Figure; only that the inferior Side is ſomewhat ſinuous, and the exterior ſomewhat convex. They are very thick, but not every where alike; for on their ſuperior Part they retain in ſome meaſure that pointed Part which belongs properly to the *Spinæ*; but in the inferior Part they grow broader, and are thickeſt of all at the Extremity. Theſe *Spines* are not equal in their Magnitude, in reſpect to one another; for as the *Vertebræ*, the lower they are, the bigger are their Bodies; ſo on the contrary, the Spines, the higher their Poſition is, the bigger they are: So that the biggeſt *Vertebræ* have the leaſt Spines, and the lowermoſt *Vertebra*, which is the biggeſt of all, has the ſmalleſt *Spina*.

They have alſo their *Foramina*, or Holes; *One proper*, which is very large, and gives Paſſage to the Spinal Marrow; and *Two common*, through which the Nerves have their Egreſs into the adjacent Parts, and the Veins and Arteries their Ingreſs. Theſe Holes are formed by the Conjunction of the *Sinus's* of the *Vertebræ*, yet ſo, that the biggeſt Part by much is made by the ſuperior *Vertebra*, the inferior contributing but a very ſlender Share towards it; whereas on the contrary, as we told you before, among the *Vertebræ* of the Neck, the inferior furniſhes the greateſt Part, and thoſe of the *Thorax* an equal Share.

CHAP. XV.

Of the Os Sacrum.

THE *Os Sacrum* has its Poſition in the lowermoſt Part of the Back. It is call'd Ἱερὸν, or *Sacrum*, by the ancient *Greeks*, from its Breadth, becauſe they call'd every Thing that was large, *Holy*; it being the broadeſt of all the Bones belonging to the Back, and ſerving inſtead of a *Baſis*, which ſupports the whole Frame of the *Vertebræ*.

This Bone conſiſts for the moſt Part of Five, and ſometimes alſo of Six Bones, to wit, according as the *Os Coccygis* is compos'd either of Four or of Three only. But this muſt be underſtood from very young People, in which theſe Bones are plainly diſcernable, being conjoin'd by Cartilages; whereas in adult Perſons they are united ſo cloſely, that they appear to be but One Bone, without the leaſt Mark of any former Connexion, unleſs it be in the anterior Part, where ſome very ſlender Tracts of cartilaginous Rudiments remain conſpicuous.

Theſe Bones are nothing elſe but *Vertebræ*, as is evident both by their Figure and by their Uſe. By their Figure, becauſe each of them has its Body and Proceſſes; by their Uſe, becauſe they are excavated in the Na-

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ture of the *Vertebræ* for the Reception of the *Spinal Marrow*, which terminates at laſt in this Bone. But theſe Bones nevertheleſs have ſomething that is directly contrary in the other *Vertebræ* of the Back; for theſe, the nearer they approach to the lower Parts, the bigger they are; whereas theſe, on the contrary, leſſen moſt manifeſtly by degrees: So that the uppermoſt is the biggeſt, and the lowermoſt the ſmalleſt of all, becauſe they grow narrower gradually; ſo that the whole *Os Sacrum* is not unlike to a Triangle. It has a convex and a concave Part; the Firſt looks towards the Back, the other towards the Breaſt. Each of them have their *Foramina*, which are formed by the *Sinus's* of the *Vertebræ* that are conjoin'd with one another; but the interior are much larger than the exterior, and give Paſſage to the Nerves. They have alſo a large *Foramen*, through which deſcends the Spinal Marrow, which manifeſtly decreaſes in the inferior Part, together with the Marrow.

It is provided with Proceſſes of all Sorts. The *oblique* are ſomewhat obſcure, unleſs it be in the Firſt, where the *ſuperior* are very conſpicuous, and receive into their *Sinus's* the ſmall Heads of the lowermoſt *Vertebræ* of the Loins.

The *tranſverſe* are longer, and ſo cloſely united together, that they ſeem to be but One; but the higher they are, the thicker they are, and each of them at its Extremity has an unequal *Sinus*, which receives the *Os Ilium*. The *poſterior*, or the *Spines*, are like unto the *Spinæ* of the *Vertebræ* of the Loins, yet much ſmaller; and the lower they are, the ſmaller they grow; ſo that the laſt appears only like an orbicular Prominency.

CHAP. XVI.

Of the Os Coccygis.

THE *Os Coccygis*, call'd the *Cauda*, or the Tail, by the vulgar *Latinſts*, is compoſed alſo of ſeveral other Bones, ſometimes of Four, ſometimes of Three, according as the *Os Sacrum* contains either Five or Six; as has been ſaid before.

Theſe ſmall Bones have a very ſoft and ſpongious Subſtance, without any Proceſs, *Foramen*, Cavity, or Spinal Marrow, all which are extant in the other *Vertebræ*: However, they are broader above than below, the ſuperior always exceeding the next following in Magnitude; ſo that they terminate in a Point not unlike to the Beak of a Parrat. In Women it ſtands hereabouts a little outwards, to prevent the Compreſſion of the Neck of the Womb in Child-bearing Women; but in Men it bends inward, for the Defence of the *Inteſtinum Rectum*, for whoſe Sake it was made: And this I ſuppoſe to be the Reaſon why the *Procidentia Ani* is very common in Children, where this Part is rather of the Nature of a Cartilage than of a Bone.

It is conjoin'd with the *Os Sacrum* by the Means of a Cartilage, but by a very looſe Connexion, that ſo it might be able to give way for the better Excretion of the indurated Excrements: For were it otherwiſe, it would be ſubject to frequent Luxations; as it happens ſometimes to Women that have a very hard Labour, but is ſoon reduced by tying a Rowler very ſtreight about the Buttocks. The *Firſt* of them has a ſlender *Sinus*, in which it receives the laſt *Vertebra* of the *Os Sacrum*: But when the *Os Sacrum* conſiſts of Five *Vertebræ*, the uppermoſt Bone of the *Coccyx* has Two acute ſmall Proceſſes, which ſtretching upwards, are ſtrongly united with the Proceſs of the Fifth *Vertebra* of the *Os Sacrum*, and form a *Foramen*, or Hole, through which the Sixth Pair of Nerves of the *Os Sacrum* takes its Egreſs.

CHAP.

CHAP. XVII.

Of the Ribs.

THE *Thorax* requiring not only a ſolid Defence or Rampire for the Heart, but alſo a continual Motion for the Conveniency of the Lungs, as the *Sternum* and *Claviculæ* were plac'd on the fore Part, to anſwer the Firſt End, and the *Vertebræ* behind, ſo were the Ribs on the Sides, intermix'd with Fleſh, to anſwer both theſe Intentions.

There are Twelve Ribs, as well in Men as in Women; ſo that it muſt be look'd upon as a Fable, that the Males have One Rib leſs, becauſe the Woman was made out of the Man's Rib. 'Tis beyond all Diſpute, that ſome Perſons have had Thirteen Ribs, but that is very ſeldom, and much ſeldomer that One is defective.

However, among the Twelve Ribs, the Seven *ſuperior* are by the Anatomiſts call'd the *true*, and the Five *inferior* the *ſpurious* Ribs. The Firſt are ſo call'd becauſe they reach to the *Sternum*, and ſo make a perfect Circle, and the laſt are call'd *ſpurious* becauſe they are ſmaller than the reſt, nor reach to the *Sternum*, but terminate in the Sides.

The Subſtance of all the Ribs is partly cartilaginous, partly bony. Their oſſeous Subſtance is very ſoft and ſpongious, but much harder in the *true* than in the *ſpurious*, which are very ſoft, and in a manner cartilaginous, partly for the Security of the Ribs themſelves, partly of the ſubjacent Parts. The *cartilaginous* Part is ſo hard and thick in the *true* Ribs, that they are converted into Bones in aged People, and in Women when their Breaſts ſwell to a good Bigneſs: But the *Cartilage* on the ſpurious Ribs is on the contrary ſo very ſoft, that it retains its cartilaginous Nature; and if it happens to undergo ſome Alteration, it is not very remarkable. The *cartilaginous* Part is ſhorter, but thicker, in the *true*, and ſlenderer and narrower in the *ſpurious* Ribs.

The Seven *true* Ribs are conjoin'd on the anterior Part with the *Sternum*, on the poſterior with the *Vertebræ*: To the *Sternum*, by that Kind of *Enarthroſis* which is call'd *Arthrodia*; for the *Sternum* has certain *Sinus's*, which receive the ſmall Heads of the Cartilages: But with the *Vertebræ* they are articulated, *firſt* with the *Sinus's* of the Body of the *Vertebra*, by Means of their ſmall Heads, that are incruſtated with a Cartilage; and *next* by ſome Prominencies, inveſted alſo with Cartilages, and fix'd within the *Sinus's* of the tranſverſe Proceſſes, where they have alſo ſome Inequalies, to give the ſtronger Origination to the Ligaments which faſten them to the *Vertebræ*.

The *ſpurious* Ribs being bent a little upwards towards the anterior Part, run along and by one another, and are at laſt agglutinated to one another, and to the Cartilages of the *true* Ribs, excepting only the Twelfth; but the Eighth and Ninth are on the poſterior Part conjoin'd with the *Vertebræ* in the ſame Manner as the *true* Ribs, to wit, by a double Articulation; the Tenth rarely by a double, but generally by a ſingle One; but the Eleventh and Twelfth are united with the *Sinus's* of the Body of the *Vertebra* by One ſmall Head only. This *Sinus* is not the ſame in all, for in the Firſt *Vertebra* it is in the Body it ſelf, but in the Eighth following, at the Sides of the ſuperior and inferior Proceſſes. The Three laſt, or undermoſt, have alſo their peculiar Ones.

As to their Figure, they are all ſemicircular, being convex on the Outſide, and concave on the interior Part; but their *Magnitude* is ſomewhat different, the *ſuperior* and inferior being the ſhorteſt, and the middle Ribs the longeſt.

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The Firſt and Laſt are the ſhorteſt of all the reſt; the Second and Eleventh are a little longer; the Third and Tenth a little more; but the Sixth, Seventh, and Eighth, are the longeſt, becauſe the *Thorax* is ſomewhat wider in the Middle than above and below. The Length of the cartilaginous Part is anſwerable to that of the Ribs; ſo that the longeſt Ribs have the longeſt Cartilages. The ſame Thing may be ſaid of their Breadth and Thickneſs; for the Firſt Rib, which is the broadeſt of all, terminates alſo with the broadeſt Cartilage; and the Eleventh and Twelfth, which are the ſmalleſt, with the ſlendereſt Cartilage.

The oſſeous Part of the Ribs is very thick and narrow on the poſterior Part, where they are join'd with the *Vertebræ*; but on the anterior Part, where they approach to the *Sternum*, it becomes ſlenderer and broader. On the ſuperior Part they are blunt, but on the inferior ſharp, and on the laſt they have a *Sinus*, not unlike a Canal, ſtretching all along through their whole Length. It is broader towards the *Vertebræ*, but grows ſlenderer by degrees, as it proceeds towards the anterior Part. This ſerves for a ſecure Receptacle to the intercoſtal Veſſels, to wit, the Veins, Arteries, and Nerves.

The Uſe of the Ribs (as we told you before) is to ſerve for a Safeguard to the Heart, and at the ſame time to facilitate the Motion of the *Thorax* in Inſpiration and Expiration.

CHAP. XVIII.

Of the Os Innominatum.

THE broad Bone, which is ſituated at the Sides of the *Os Sacrum*, is call'd the *Innominatum* by *Galen*, which it has retain'd to this Day. *Homer*, who liv'd many Ages before *Galen*, has given it the Name of *Iſheon*, which has been retained by *Ruffus*, and ſome of the following Anatomiſts, which have call'd it the *Os Iſhium*, or *Ilium*. It is not One ſingle Bone, but conſiſts of Three others, conjoin'd with one another by the Means of Cartilages; which Conjunctions remain apparent in Children till they are Seven Years old; but in adult Perſons the Cartilage dries up, and is loſt by degrees; ſo that theſe Three Bones are united by *Symphyſis* into one and the ſame Bone. Notwithſtanding which, our modern Anatomiſts diſtinguiſh the *Os Innominatum* even in adult Perſons into Three particular Bones. The *Firſt* they call'd the *Ilium*, which occupies that Part which is to the Side: The Second the *Os Coxendicis*, which makes that Part where the *Acetabulum* is for the Reception of the Head of the *Femur*: The *Third*, the *Os Pubis*, or the *Pecten*, which has a very large *Foramen*. The *Firſt* is ſituated on the ſuperior Part, the *Second* on the inferior, and the *Third* on the anterior.

The Terminations or Diſtinctions of theſe Bones are to be diſcover'd in that great *Sinus* of the *Coxendix*, where cartilaginous Lines run from the Center to the Circumference, Two whereof are extended to the ſuperior Part, One, to wit, the Firſt, to the anterior Part, the Second to the poſterior, and the Third from the Center to the inferior. Among theſe, the Two Firſt make the *Ilium*, the Second and the Third the *Os Coxendicis*, and the Third and Firſt the *Os Pubis*.

The *Os Ilium* is the broadeſt and biggeſt, and on its ſuperior Part ſemicircular, being concave on its interior, and convex on its exterior Part. The *Semicircle* is call'd the Spine of the *Os Ilium*, the Cavity the *Coſta*, and the Convexity the *Dorſum*.

The *Spine* is a very rough Appendage, for the Connexion of the Muſcles; for on its exterior Part the *Obliqui Aſcendentes* of the *Abdomen* have their Origination, and the *Deſcendentes* their Inſertions; on its interior Part, the carneous Part of the *Tranſverſus*;

and on its anterior Part the Firſt Pair of the *Flexores* of the *Tibia*. The *Dorſum* is taken up by the Three *Glutæi*, where they have their Originations; for which Reaſon Three rough Lines are to be ſeen here, the better to ſecure their Beginning.

The *Coſta* is cover'd all over by the *Iliacus Internus*.

Theſe Bones are conjoin'd with the *Os Sacrum* by a long Tract, which is altogether like unto its tranſverſe Proceſſes, being uneven, and diſtinguiſh'd by divers Prominencies and ſmall *Sinus's*, ſo that the *Sinus's* of theſe Bones are exactly correſpondent to the Proceſſes of the other, and contraryways the Proceſſes to the *Sinus's*, for their more firm Connexion.

The *Second* is call'd the *Os Coxendicis*, or *Coxæ*, being ſituated in the Middle, betwixt the *Ilium* and the *Oſſa Pubis*. It has a *Sinus*, (call'd the *Acetabulum* of the *Coxendix*) which receives the Head of the *Femur*, being the biggeſt of all that are obſervable in the humane Body, among thoſe that ſerve for the Articulation of ſome other Parts.

This *Sinus* is ſurrounded with a Brow, and is larger in the poſterior than in the anterior Part, and in the ſuperior beyond what it is in the inferior, for the Coveniency of the Flexion of the *Femur* in an acute Angle when we are ſitting. But on that Side where the *Oſſa Pubis* lie, this Brow is wanting, by reaſon of the Vein that paſſes that Way, and which carries back the Nutriment from the Joint, for the Generation of that glutinous and tenacious Humour which is requiſite for the Humectation of the Joint, without which it would be quite exſiccated in its ſtrong and long continued Motions. This *Sinus* is covered all over with a very ſmooth Cartilage, unleſs it be on its anterior Part, where it has ſome Holes, for the Conveniency of that round Ligament, which having its Beginning there, is inſerted into the Head of the *Femur*.

There is alſo another *Sinus* obſervable in the *Os Coxendicis*, to wit, on its poſterior and internal Part; about which, like a Pulley, the *Muſculus Obturator Internus* is reflected.

Neither muſt we paſs by in Silence its Appendage, which is plac'd at its whole inferior Part, upon which we ſit. This is very broad, in proportion to the Bone unto which it belongs, becauſe divers very conſiderable Muſcles have their Origination there, to wit, the *Third*, *Fourth*, and *Fifth*, of the *Flexores Tibiæ*. It has alſo Two Prominencies in the Circumference of the *Acetabulum*, to wit, one *internal* and the other *external*. From the Firſt the *Muſculus Rectus* has its Riſe; and into the laſt, which is very acute, is inſerted a Ligament, which has its Beginning in the Fifth Proceſs of the *Os Sacrum*.

The *Third* Bone is call'd the *Os Pubis*, which being ſituated in the anterior Part, is there united with its Fellow by a thick and unequal deſcending Line, betwixt which is plac'd a Cartilage, which is not very hard.

It has the largeſt *Foramen* of all the Bones of the Body, reſembling almoſt unto the *Auricula*, ſituated betwixt the *Sinus* of the *Coxendix*, and that Part where it is conjoin'd with its Fellow. This *Foramen* makes this Bone to be leſs ponderous than otherwiſe it would have been: And, beſides this, affords a Place to the Two Muſcles of the *Femur*, on its exterior Part to the *Obturator Externus*, and in its interior to the *Internus*, which are ſeparated by a ſtrong Ligament, which is expanded under this *Foramen*.

Above this *Foramen* is a *Sinus*, through which the Veins and Arteries, or the crural Veſſels, take their Courſe to the Legs. Theſe Three Bones, in Conjunction with the *Os Sacrum*, form a Cavity call'd commonly the *Pelvis*, or the Baſon, which contains Part of the Inteſtines of the Bladder, and Womb.

The *Uſe* of theſe Bones is to receive the Head of the *Femur*, and conſequently to ſupport the whole Body, as alſo the Parts of the inferior *Venter*, and to defend them; but eſpecially the Inteſtines, the Bladder; and in Women, the Genital Parts.

Theſe Bones are obſerved to be in Women ſomewhat different from the Men: For, *Firſt*, the *Oſſa Ilium* are much broader in Women, and wider, and their *Spina* ſtretches more towards the Sides; which was done for the Conveniency of the *Uterus*, that when it is extended to a large Bulk by the *Fœtus*, it might reſt upon and be ſupported by them.

Secondly, In the *Bones of the Coxendix*, the inferior Parts are at a greater Diſtance from one

one another than in Men, to give the eaſier Paſſage to the Infant out of the Womb.

Thirdly, In the *Bones of the Pubes*, that rough Line where theſe Bones are conjoin'd is much ſhorter in Women than in Men; but the Cartilage, on the contrary, by the Means of which they are united with one another, is much thicker, much more laxe, and ſoft.

The *inferior Proceſſes* alſo, that are ſituated under this Line, are alſo ſtretch'd more to the Outſide; ſo that in Women, that Cavity of the inferior *Venter* which is call'd the *Pelvis*, is in many Reſpects larger than in Men, becauſe, beſides the *Inteſtinum Rectum*, and the Bladder, it contains not only the *Uterus*, but alſo the *Fœtus* in Women when they are with Child.

Concerning theſe Bones, there is a very ancient and moſt famous Queſtion among the Anatomiſts, to wit, Whether the *Oſſa Pubis* are ſeparated or parted aſunder during the Time of Parturition? In Anſwer to which, we will, without intermeddling with any Arguments *Pro* and *Con*, give you a ſhort Account only of what we have ſeen, and ſhewn to others, in relation to this Point.

It is therefore our Opinion, founded upon many reiterated Obſervations, That they do not open or ſeparate in all Women; but in thoſe only that undergo either a very hard Labour, or have thoſe Parts through which the Infant is to paſs exceeding ſtreight. Neither are they ſeparated in ſuch a Manner as to ſhew a perfect Opening, but rather a ſmall or ſlender Diviſion, by the Relaxation and Pliableneſs of the Ligaments which contributes to their Extenſion. This Relaxation is owing to that extraordinary Afflux of the Humours to the Parts dedicated to Generation, and to the Egreſs of the *Fœtus* out of the Womb, as well before the Time of Parturition, as during the moſt exquiſite Pains which attend ſuch hard Labours. For I have often obſerv'd ſome Veſſels, which at other Times are but ſmall, to encreaſe in Women, whilſt they were with Child, to the Magnitude of the Tip of a Little Finger: Whence it is, that all the Cartilages, and among the reſt, the Cartilages of the Bones of the *Pubes*, are irrigated, moiſten'd, and ſoften'd, and conſequently prepared for ſuch a ſlender Separation. I do not ſpeak this in relation to the *Oſſa Pubis* only, ſince I have, by my own Obſervations, found that Articulation alſo which unites the *Os Sacrum* with the *Oſſa Ilium* much relaxed, according as the Labour happen'd to prove leſs or more difficult. And hence it is, that after a very hard Labour, the poor Women complain oftentimes of vehement Pains about the *Os Sacrum* and the *Pubes*: To remedy which, the Midwives order them to be laid in Bed with their Feet croſswiſe, to further the Reunion of this Separation.

The Ligament alſo which faſtens the *Os Sacrum* with the *Oſſa Innominata*, is on the anterior Part, toward the *Abdomen*, very ſlender, but on the poſterior Part very thick; which for that Reaſon cannot eaſily be extended by the Affluence of the Humours; ſo that 'tis on the fore Part only where the *Oſſa Ilium* are ſeparated from the *Os Sacrum*, whilſt the poſterior Part keeps its natural Poſition. This ſeems to be done by a peculiar Contrivance of Nature, to prevent a Laxation in theſe Bones; which muſt of Neceſſity follow if the Ligament ſuffered a Relaxation on both Sides. The Truth of this I have often demonſtrated in my publick Diſſections in the Bodies of Women that died of a hard Labour; for I took off One of the *Femora*, and upon an exact ocular Inſpection, found the *Os Pubis* of that Side to jet out almoſt the Breadth of an Inch; which could not happen thus without the Relaxation of the Ligaments of both the Joints. And I obſerved the ſame Thing in the other *Femur*; which being agreable to the Obſervations made by divers other Learned Anatomiſts, I am apt to believe, That the *Os Sacrum* and the Bones of the *Pubes* ſuffer a Kind of Separation, leſs or more, according as the Labour proves more or leſs difficult; becauſe the Ligaments and Cartilages are, by the previous Afflux of the Humours to thoſe Parts, prepar'd for ſuch a Relaxation and Separation.

CHAP. XIX.

Of the Os Humeri.

WE have given you an Account hitherto of the Bones of the Three *Venters*, or great Cavities; ſo we muſt now, in due Courſe, enter upon an Examination alſo of the Bones belonging to the Limbs, which before we have diſtinguiſh'd into the *Hands* and the *Feet*. The *Hand* is call'd all that Part, which beginning at the ſuperior Part of the *Scapula*, reaches to the very Extremities of the Fingers; and is ſubdivided into Three Parts, to wit, the *Humerus*, the *Cubit*, and the *Hand*, properly ſo call'd. The *Os Humeri*, or Shoulder-Bone, call'd by the *Latins* alſo *Brachium*, or the *Arm*, is that Part which is ſituated betwixt the *Scapula* and the *Cubitus*, wherewith it is conjoin'd both above and below. It is of a very hard and ſolid Subſtance, excavated within at its whole Length like a Pipe; partly to contain the Marrow, partly to make it the leſs ponderous. Its Figure is round, but ſomewhat unequal, for the Origination and Inſertion of divers Muſcles. It is thickeſt at both it Extremities.

For on its ſuperior Part it is provided with an Appendage, from whence ariſe Two Heads, one *internal*, which is large and round, and cover'd all over with a Cartilage, being articulated with the *Sinus* of the *Neck* of the *Scapula*, and deſign'd for all the various Motions of the *Humerus*, forward and backward, to the Right and to the Left, upwards and downwards: For it is conjoin'd by the *Enarthroſis*, the moſt perfect Kind of Articulation, which is adapted for all Manner of Motions.

The *Second*, or the *External* Head, is not receiv'd into any *Sinus* like the *Firſt*; but being form'd for the Inſertion of the Ligaments, is much ſmaller, but alſo more unequal; and is divided from the larger Head by the *Sinus* that ſurrounds it on all Sides. This Head is ſubdivided into Two others, the *anterior* and the *poſterior*; the Firſt of which is much bigger than the other, which is very ſmall. They are ſeparted by an intermediate round *Sinus*, where the *Muſculus Biceps* has its Origination. From above the Shoulder-Bone it grows more ſlender and ſlender downwards, and is round on its anterior Part, but ſomewhat broad and flat on the poſterior Part, for the Conveniency of the Muſcles that have their Situation on that Side.

On its *lowermoſt* Part it begins to grow bigger again, and diſcovers to us a great Variety of Proceſſes. For ſince it was heretofore to be articulated with Two Bones, viz. with the *Cubitus* and the *Radius*, and both theſe have Two Motions, it was requiſite it ſhould be provided with ſeveral Heads. Its *inferior* and *interior* Head is articulated with the *Cubitus* by *Ginglymus*, and is by ſome call'd the *Rotula*, or *Trochlea*, from its Reſemblance to a Pulley; it being not only orbicular in the Middle, and flat on the Sides, but alſo excavated in its middle Part juſt like that Part of the Pulley where the Rope runs, and with Two ſmall Prominencies on each Side: However it protuberates a little more on the interior than on the exterior Part. It has Two *Sinus's*, one before, the other behind, diſtinguiſh'd by a very thin Lamel or Scale; among which, that on the anterior Part is the leſſer of the Two, and receives the anterior Proceſs of the *Cubitus*; but the other, which is much larger, was form'd for the poſterior Proceſs of the ſame Bone.

Its *Second* and *External Head* is conjoin'd with the *Radius*, and inveſted with a Cartilage. On both Sides of theſe Heads are certain Prominencies, call'd *Tubercula*; that which is neareſt to the *Trochlæa* being call'd the *Internal*, and the other the *External*, both being deſign'd for the Originations of

veral Muſcles: For moſt of the Muſcles that are ſituated on the interior Part of the Bones of the *Cubitus* and *Radius*, have their Riſe from the internal Prominency; as thoſe that are plac'd on the exterior Side have theirs from the external. The interior is larger by much than the external; but both terminate in an acute Line, and reach a great way towards the ſuperior Part of the *Humerus*. On their Sides are certain *Sinus's*; and *firſt*, one on the Side of the *external*, in the poſterior Part of the *Humerus*, for the Fourth Pair of Nerves of the Arm; and *next*, another at the Side of the *internal*, on the anterior Part, for the Third Pair of Nerves that paſs that Way, and on the poſterior for the Fifth Pair.

It has no remarkable *Foramina*, excepting that in its ſuperior Part it has ſome ſmall ones, which are diſorderly diſpoſed, and deſigned for the Riſe and Inſertion of the Ligaments. In the Middle of its Length, on the interior Part, it has nevertheleſs a plain *Foramen*, which ſtretching downwards, penetrates into the innermoſt Subſtance of the Bone, to give Paſſage to a conſiderable Branch, which reaching to the medullary Cavity, was deſign'd for the Nutrition of the Bone.

CHAP. XX.

Of the Ulna, *and the* Radius.

THE Second Part of the *Arm* is call'd the *Cubitus*, the *Cubit*, and conſiſts of Two Bones, the leaſt of which is plac'd on the exterior, and the other in the interior Part of the fore Arm. The laſt is call'd *Ulna*, and by ſome *Cubitus*, and the former the *Radius*: The Functions of both which Bones are ſo artificially contriv'd by Nature, that the *Cubitus* performs the Office of Flexion and Extenſion, the Flexion in an acute Angle, and the Extenſion in a ſtreight Line; but the *Radius* was made chiefly for the Motion of the Hand, and its Palm, upwards and downwards, call'd *Pronation* and *Supination*.

Theſe Bones have certain Things *common* with one another, others *contrary*, and others *proper*. Among the *common* is their Subſtance, they being both very hard and ſolid, excepting the Appendages. They are both hollow within like a Pipe, for the Conveniency of the Marrow, and to avoid their Ponderoſity. Their *Figure* is alſo not very different. They are both long, with ſeveral long Inequalities, for the Conveniency of the Muſcles. They have alſo both their Heads, among which, in each of them, one is broader and larger, and the other ſlenderer and ſmaller. They are *contrary* to one another in this only, that the *Ulna* has a pretty large Head on its ſuperior Part, for its Motion, and a ſmall one on its lower Part; whereas the *Radius*, on the contrary, has a thin and round Head at its ſuperior Part, becauſe it contributes very little to the Flexion and Extenſion of the upper Joint; but a broad one at its inferior Part, for its better Articulation with the *Carpus*, and the *Pronation* and *Supination* of the Hand.

But the *Ulna*, on its ſuperior Parts, where its largeſt Head is plac'd, is convex on its Backſide; but before, is provided with a ſpacious ſemicircular *Sinus*, which is inveſted with a Cartilage, call'd by ſome *Sigiformis*. This *Sinus*, both on its ſuperior and inferior Part, emits a Proceſs, the firſt of which is inarticulated with the poſterior *Sinus* of the *Humerus*, the latter with its anterior. The firſt is call'd the poſterior Proceſs of the *Cubitus*, being large and obtuſe; the latter is much ſmaller, and has an acute Angle. This *Sinus* is articulated with the *Trochlea* of the inferior Head of the *Humerus*, being made exactly anſwerable to it. It has alſo another *Sinus* beſides this on its exterior Side, which makes about a Fourth Part of a Circle; and being inveſted with a Cartilage, receives

receives the ſuperior and leſſer Head of the *Radius*. Afterward, as the *Cubitus* deſcends lower towards the Hand, it grows ſlenderer by degrees, till it terminates in that ſmall Head, which (as we told you before) has a round *Sinus*, from the poſterior Part of which ariſes a ſmall Proceſs, which from its Figure they have call'd *Styloides*.

The *Radius* has on its *ſuperior* Part a *Neck*, unto which is annexed a ſmall Head, with a round *Sinus*, inveſted with a Cartilage, into which is received the exterior Head of the inferior Appendage of the *Humerus*. It jets out alſo a little on the Side, being alſo incruſtated with a Cartilage, in that Part where it is articulated with the lateral *Sinus* of the *Cubitus*, which reſembles unto the Fourth Part of a Circle, by which the *Pronation* and *Supination* of the Palm of the Hand is performed.

On the interior Part of this ſmall Head ariſes an oblong Protuberancy, which has an unequal *Sinus*, in which the *Muſculus Biceps* has a very ſtrong Inſertion. From hence the *Radius* extends downwards obliquely towards the Hand, and recedes gradually from the *Ulnæ*, ſo as to leave a ſufficient Interval betwixt both for the Muſcles that are ſituated there. In that Part which is neareſt to the Hand it forms a broad but ſmall Head, which is provided with a double *Sinus*, for the Reception of the ſmall Bones of the *Carpus*: And on its interior Part it has a lateral *Sinus*, which receives the inferior Protuberancy of the *Cubitus*.

As to the mutual Connexion of the *Cubitus* and *Radius*, it is very obſervable, that theſe Bones are articulated with one another by a very different Conjunction, for the *Radius* is received by the *Cubitus* in its ſuperior Part, and on the contrary, in the inferior Part, the *Cubitus* by the *Radius*: The Reaſon of which Articulation is, becauſe the *Radius* is broadeſt near the *Carpus*, and the *Cubitus* near the *Humerus*: And ſince theſe Bones receive with more Eaſe the Inarticulations of each other on that Part where they are broadeſt, they either receive or are received, as they are either bigger or ſmaller; for a *Sinus* is naturally more proper for a large Bone, as the containing Part ought to be larger than that which it contains. Theſe Two Bones are alſo tied together by a long Ligament, which ſeparates the internal from the external Muſcles, and ariſes from Two Lines, which are oppoſite to one another, one of them being plac'd on the exterior Side of the *Cubitus*, and the other on the interior Part of the *Radius*.

CHAP. XXI.

Of the Bones belonging to the Hand, *properly ſo call'd; and of the Bones call'd the* Seſamoidea.

THE *Third* Part of the *Arm*, or the Hand, being all that Part which is annexed to the *Cubitus* and *Radius*, is alſo diſtinguiſh'd into Three Parts, to wit, the *Carpus*, or *Brachiale*; the *Wriſt*; the *Metacarpus*, or *Poſtbrachiale*; and the *Fingers*. The *Carpus* is the ſuperior Part, the *Metacarpus* is plac'd in the Middle, and the Fingers are the lowermoſt of all.

The *Carpus* is articulated with the *Radius* on its ſuperior Part; on its inferior with the *Metacarpus*. It conſiſts of Eight ſmall Bones, whoſe Subſtance is ſoft, and full of ſmall Holes on the Inſide; though their exterior Part ſeems to be ſolid, becauſe in their firſt Generation they were not Bones, but only Cartilages, which are indurated afterwards by degrees.

Their Figure, conſider'd as they are join'd together, is convex on the exterior, and concave on the interior Part; but if examin'd ſeparately and ſingly, they are of different Figures, peculiar to themſelves, and adapted moſt commonly to the Poſition of the adjacent

jacent Bones. They are conjoin'd with one another by ſtrong Cartilages and Ligaments, by that Kind of Articulation which is call'd *Neuter*; for in reſpect of their Connexion, which is laxe, they imitate a *Diarthroſis*; but in reference to their obſcure Motion, a *Synarthroſis*.

It conſiſts of Eight ſmall Bones, which are diſtinguiſh'd into a double Row, each of which has Four. The ſuperior Row has the Three external Bones conjoin'd in ſuch a Manner, that they ſeem to be but One, and the Fourth, which is the leaſt of all the reſt, is plac'd under the Little Finger; but the lower Row is articulated with the Four Bones of the *Metacarpus*.

For the *Metacarpus*, which is the *Second* Part of the Hand, conſiſts of Four Bones, not of Five, as ſome will have it, who reckon the Firſt Bone of the Thumb among them, but erroneouſly, becauſe the Articulation of that Bone is very different from that of the Bones of the *Metacarpus*; beſides that, its Motion is manifeſt. The Articulation is different, becauſe it is conjoin'd with the *Carpus* by *Diarthroſis*; but the others are by a *Neuter* Articulation. Its Motion, becauſe that Bone has a manifeſt Motion forward, backward, to the Right and Left; but in theſe is either none at all, or at leaſt a very obſcure Motion.

The Subſtance of theſe Bones is hard and ſolid, and hollow on the Inſide in the Nature of a Pipe. They are of a rotund Figure, which nevertheleſs is ſomewhat broader on their exterior Side, eſpecially on the ſuperior Part, where their Surface is plain or flat; but on the Inſide they are convex, as if the Plains from the exterior Side were raiſed on both their Extremities, and conjoin'd in one acute Line, which forms an Interval for the *Muſculi Interoſſei* of the Fingers.

As to their *Magnitude*, they are much bigger than thoſe of the Fingers, but differ very much both in Longitude and Latitude, in reſpect to one another: For that which is plac'd at the *Index* is the longeſt and the thickeſt; the Second, which is at the Middle Finger, is not quite ſo long, nor ſo thick; the Third is ſtill ſhorter; and the Fourth the leaſt of all. They have an Appendage, as well on their ſuperior as inferior Part. By the Firſt they are articulated with the Bones of the *Carpus*, and by the latter with the Fingers. The Firſt has a *Sinus*, but the other a ſmall Head, which is round and oblong, and inveſted with a Cartilage; but ſomewhat flat on the Sides.

The Fingers conſiſt of Fifteen Bones, *viz.* Three in each, being conjoin'd in certain Ranks, call'd by the *Greeks Phalanges*. Theſe Bones have no peculiar Names; but have their Denominations from the Fingers unto which they belong: As for Inſtance; The *Firſt*, *Second*, or *Third*, of the *Thumb*, *&c.* the *Firſt* being that which is ſituated neareſt to the *Metacarpus*, the next adjoining to that the *Second*, and the *Third* the laſt of all.

They are all of a hard Subſtance. Their Figure is concave on the Inſide, and convex without; broad on the inferior Part, and narrow on the ſuperior; but on the Right and Left Sides they have ſome ſtreight Lines. The Third begins with a broad Baſis, and terminates in a ſmall round Head. They differ in their Magnitude, the *Third* being the leaſt, the *Second* ſomewhat bigger, and the *Firſt* the largeſt of all.

They have their Appendages both on the ſuperior and inferior Part; but the *Third* has only One on the ſuperior Part; becauſe on its inferior it is not conjoin'd with any other Bone. The ſuperior Appendages are provided with *Sinus's*, the inferior with *Heads*. The ſuperior of the *Firſt* Bone has but One *Sinus*, into which it receives the ſmall Head of the *Metacarpus*, that is anſwerable to it; but the inferior has a double ſmall Head, which is oblong, and protuberates on both Sides of the anterior Part. The ſuperior of the *Second* Bone has a double *Sinus*, diſtinguiſh'd by an oblong Prominency, for the Reception of the ſaid double Head; and the inferior has alſo Two ſmall Heads. The *Third* has a double *Sinus* on its ſuperior Part; but at its Extremity, or inferior Part, an unequal ſmall Head, almoſt of a ſemilunar Figure, for the Inſertion of the Tendon of the *Muſculi Flexores Digitorum*. In the ſame Manner it is with the Thumb, only that the ſuperior Appendage of the Firſt Bone has its *Sinus* not quite ſo deep, but ſomewhat protuberating both on the anterior and poſterior Part; but the inferior

ſerior has only One ſingle ſmall Head: Whence it is, That the *Sinus* of the ſuperior Appendage of the Second Bone, which is anſwerable to it, muſt alſo be ſingle.

The Bones call'd the *Seſamoidea*, from their Reſemblance to the *Semen Seſami*, have their Poſition in the interior Part of the Hand, in the Internodes of the Fingers. Their Subſtance is at firſt cartilaginous, but afterwards oſſeous, and full of Holes like a Pumice-Stone. Their Figure is not unlike unto the *Patella*, which is placed upon the Joint of the *Femur* and *Tibia*; and they ſeem to have the ſame Uſe alſo. As to their Number, it is uncertain, there being ſometimes more, and ſometimes fewer; but they are commonly computed to be Twelve. Two of them have their Poſition at the Second Bone of the Thumb, where it is conjoin'd with the Firſt on the interior Part; Two betwixt the Firſt Internodes of the other Four Fingers, where they are articulated with the *Metacarpus*; and laſtly, Two at the Second and Third *Internodium* of the *Index*, in each One, and that by Means of the Tendons of the *Muſculus Flexor* of the Third Joint of the Fingers.

Their Uſe is to prevent the Laxations of the Bones in violent Extenſions of the Bones, which elſe might ſoon be diſlocated.

CHAP. XXII.

Of the Os Femoris, *and of the* Patella.

AS the Arm is divided into Three Parts, ſo the Leg alſo may moſt properly be diſtinguiſh'd into Three, to wit, the *Femur*, or *Thigh*; the *Tibia*, or *Leg*; and the *Foot*, properly ſo call'd.

The *Os Femoris*, or Thigh-Bone, is ſingle, and the largeſt of all the Bones of the humane Body, not only in reſpect of its Length and Thickneſs, but alſo of its Solidity and Strength: For its Subſtance is very hard, but excavated in the interior Part in the manner of a Pipe, to prevent its being too ponderous, and to adapt it for the Marrow that is contained within this Cavity. Its Figure is oblong, but ſo as to be convex before, and concave behind, broad on both Sides near its Extremities, but eſpecially on the inferior Part; but in the middle Part it is exactly round, were it not for a ſmall Ridge, call'd the *Linea Aſpera*, which on its Backſide runs from the uppermoſt to the lowermoſt Part. Above it is articulated with the *Os Coxendicis*, but below with the *Tibia*.

It has Two *Appendages*, the *ſuperior* of which has towards the interior Part a very large Neck, which ſtretches obliquely upwards, upon which is fix'd a Head, the biggeſt of all that belong to the humane Body, being exactly ſemiglobular, ſmooth, even, and incruſtated with a very thick Cartilage. Near its Middle it has a Pit or Hole, into which is inſerted a very ſtrong round Ligament, ariſing from a *Sinus* of the *Os Coxendicis*.

But beſides this *Head* and *Neck*, it emits alſo Two Proceſſes: The *Firſt* is the *External*, which riſing from a broad *Baſis*, grows narrower by degrees. It is very conſiderable; nay, the biggeſt Proceſs in the whole humane Body; I mean, among thoſe that are not conjoin'd with any other Bone. The *Second*, the *Internal*: It is not near ſo big as the former, and has an obtuſe Angle. Theſe Two Proceſſes have the ſame Functions with the other Proceſſes of the humane Body, to wit, to ſerve for the Inſertion of the Muſcles; from whence they are call'd *Trochanteres*, or *Rotatores*. As to the *firſt* and the *great*, we muſt take Notice of its *Sinus*, Impreſſions, and its Line. It has a large *Sinus* in the internal Part, in which are inſerted the Tendons of the Second and Third Muſcle that turn the *Femur*. It has Four Impreſſions or Dents at its convex and exterior Part: The *Firſt* is very large

large in its lowermoſt Part, for the Inſertion of the Firſt Muſcle that extends the *Femur*; the *Second* on the anterior Part, being ſomewhat unequal and ſinuous, for that of the *Second*; the *Third* on the inferior Part, in the midſt betwixt Two Impreſſions, being ſomewhat convex, for that of the *Third*; and the *Fourth* on the ſuperior, or at the very Point of the Proceſs, for the Inſertion of the Tendon of the *Fourth*.

The *Linea Aſpera*, or Ridge, begins at the Firſt Impreſſion, ſtretching downwards ſomewhat obliquely through the poſterior Part of the *Femur*, where is the Inſertion of the Firſt Muſcle of the *Femur*.

The *Inferior Appendage* of the *Femur* forms Two remarkable Heads, which incline rather to the fore than to the hind Part; One of which, being the *interior*, that looks towards the Body, is the thickeſt of the Two; but the *Second*, on the exterior, is the broadeſt, and ſomething flat. Betwixt theſe there is a *Sinus* both before and behind; *before* there is One, which being very ſmooth, and cover'd with a Cartilage, receives the Tubercle of the *Patella*; but that which is *behind* is large, almoſt of the Bigneſs of a Thumb; which was done, partly for the Support of that large Ligament which has its Riſe in the *Femur*, and its Inſertion in the Prominency that is betwixt the Two *Sinus's* on the riſing Part of the *Tibia*; partly for the Security of thoſe Veſſels that take their Paſſage that Way to the Leg, to wit, to the largeſt Nerve of the whole Body, and to the Vein and Artery. Each of theſe Two *Heads* has its *Sinus* on the Sides, for the Tendons of the Muſcles of the Leg, that paſs that Way.

Near to theſe *Appendages* are alſo ſome ſuperficial Holes, which ſerve for the Inſertion of the ſtrong round Ligaments that ſurround the Joints. Neither ought it to be paſs'd by in Silence, That in the poſterior Part of the inferior Heads there are to be obſerv'd Two Bones, that reſemble the *Semen Seſami*, which provident Nature has thought fit to place at the Two Originations of the Firſt Muſcle that moves the Foot, to prevent its Attrition by the ſaid Heads, in violent Motions.

The *Patella*, *Mola*, or *Rotula*, the Knee-pan, is a broad and roundiſh Bone, about the Bigneſs of Two Inches, ſmooth on the Outſide, and full of Holes, but ſomewhat convex, and inveſted with a Cartilage, on the Inſide; being plac'd before the *Os Femoris* and that of the *Tibia* to prevent their exceſſive Extenſions, and the *Femur* from ſlipping out of the *Tibia*, which would hinder us from walking in ſteep Places, where there is requir'd a ſtronger Extenſion of the Leg; as it happens when this Bone is either fractur'd or diſlocated, when we are able to walk upon even Ground without much Trouble; but dare not go down a ſteep Hill. Its Subſtance is at its firſt Beginning ſoft and cartilaginous, and continues to be ſuch for many Months after; but by degrees turns oſſeous. Its *Connexion* is the ſame with that of the *Oſſa Seſamoidea* with the Fingers; for it is conjoin'd with the beforeſaid Two Bones by the Means of the thick Tendons of the Second, Third, and Fourth Muſcles that extend the Leg; which deſcending through the Knee to the Leg, are inſerted into its anterior Protuberancy.

CHAP. XXIII.

Of the Two Bones belonging to the Leg.

THE *Tibia* is the Second Part of the Leg, plac'd betwixt the Knee and the Foot. It conſiſts of Two Bones, One of which, to wit, the thickeſt, retains the Name of the whole, being call'd the *Tibia*, and the Second, which is ſlenderer, the *Fibula*, or *Perone* in *Greek*. The firſt occupies the interior, and the latter the exterior Part. They are both of a hard and ſolid Subſtance, excavated within in the Nature of a Pipe.

The *Tibia* is provided with Two *Appendages*, each of which is broader than the Bone it ſelf. The *ſuperior* is articulated with the *Femur* by *Enarthroſis*, and inclining a little from the anterior to the poſterior Part, where it is ſplit into Two Prominencies, which protuberate a little beyond the Bone. This Appendage has at its upper Extremity Two oblong *Sinus's*, which are ſuperficial, and inveſted only with a thin Cartilage, into which it receives the Two inferior Heads of the *Femur*. Betwixt theſe is plac'd an unequal and rough Prominency on the poſterior Part of the Bone, with a rugged Point, into which is inſerted that ſtrong Ligament, which ariſes and proceeds (as we told you in the preceding Chapter) from that large and wide *Sinus* that is ſituated betwixt the Heads of the inferior Appendage of the *Femur*. But that they might not be apt to ſlip out of theſe ſuperficial *Sinus's*, (which were abſolutely requiſite for the Flexion of the *Tibia* into a very acute Angle) and conſequently be ſubject to frequent Luxations, Nature has placed a peculiar Cartilage at the Circumference of both of them; which being thick, grows thinner towards the Center, and is annexed by the Help of Ligaments.

It has alſo a ſmall Head on the poſterior Part, under that external Protuberancy which enters into the ſuperior Appendage of the *Fibula*. It is round in its Circumference, excepting that it has a ſlender Prominency, and is incruſtated with a Cartilage. In the anterior Part of the *Head* of the *Tibia* there are alſo abundance of Holes, which render its Surface ſomewhat unequal. It has alſo a conſiderable Protuberancy along the Length of the Firſt Line, which turns off a little above. In it is inſerted a Tendon, which is a Compoſition of the Tendons of the Second, Third, and Fourth Muſcles that extend the Leg. From thence downwards the *Tibia* grows ſlenderer by degrees; but is not round, as moſt of the other Bones, but triangular, conſiſting of Three *Latera*, or Sides, which are form'd by as many *Lines* or ſmall Ridges: That which is ſituated before is the ſharpeſt, and call'd the *Spine*: The other Two, which ſtand backwards, are either *Internal*, which is obtuſe, or *External*, which is alſo ſharp-edged, and receives the oblong Ligament of the *Tibia*. Theſe make Three Sides, Two of which are on the anterior, and the Third on the poſterior Part. The *Firſt* of the anterior Part is in the interior Side, convex, and deſtitute of Fleſh. It is call'd the *Anticnemium*. The *Second* is on the exterior Side, for the anterior Muſcles of the *Tibia*. The *Third* on the poſterior Part, for the poſterior Muſcles. This has a rugged Line, which beginning at the ſuperior Part, runs down to the inferior; and in its Middle is a remarkable *Foramen*, which penetrating into the interior Part of the Bone, gives Paſſage to a ſmall Vein, for the Nouriſhment of the Bone.

The *Second Appendage* makes the inferior Part of the *Tibia*, being much ſmaller than the former; and by it the *Tibia* is articulated with the *Talus* by a *Ginglymus*. It has a double *Sinus*, covered with a Cartilage, diſtinguiſh'd by an intermediate Ridge, which runs from the poſterior into the fore Part,

Part, where it afterwards terminates in a ſlender Protuberancy. The *Sinus* that is ſituated on the interior Part is larger and deeper, by reaſon of a Proceſs which the *Tibia* emits thereabouts; for the Proceſs is pretty thick, hollow on the inſide, and convex and without Fleſh on the exterior Side. It is call'd the *Malleolus Internus*, or the inner Angle. On the external Part of this Appendage is another oblong *Sinus*, which receives the inferior Head of the *Fibula*. It is rough, and not cover'd by any Cartilage.

The *Fibula* ſtands next to the *Tibia*, on the exterior Part. It is much ſlenderer than the *Tibia*, but equal to it in Length; for by as much as it is ſhorter above at the Knee, ſo much it exceeds it in Length below, where it reaches beyond the *Tibia*. 'Tis alſo very ſolid, and provided with a double Appendage; the *ſuperior* of which, being ſituated on the interior Side, has a *Sinus*, inveſted with a Cartilage, which receives the ſmall lateral Head which is under the ſuperior Appendage of the *Tibia*; but the *inferior* terminates in an acute Angle, and is inſerted into the external oblong *Sinus* of the inferior Appendage of the *Tibia*, being as well as the *Sinus* deſtitute of any Cartilage, and there forms the *Malleolus Externus*, or outer Ankle, and, in Conjunction with the *Internus*, keeps the *Talus* in its Station; nay, it contributes more to it than the *Internus*, becauſe the *Fibula* extends it ſelf ſomewhat lower; whence it is, that the *Externus* is always lower than the *Internus*.

The other Part of the *Fibula*, which is ſituated betwixt theſe Two Heads, is unequal, and like unto a Triangle, the *Latera* of which are conjoin'd, where the Muſcles that move the Foot and the Toes have a very commodious Poſition. Theſe Sides are made and diſtinguiſh'd by as many Lines or ſmall Ridges, One whereof is before, the other Two behind: The anterior is ſharp-edged, as alſo the interior of the Two poſterior; but the exterior is round. The Firſt *Latus* is made by the anterior and interior, the Second by the anterior and exterior, and the Third by the Two poſterior. But becauſe theſe Two Bones are ſeparated from one another in their middle Part, Nature has form'd a membranous Ligament, which faſtens both theſe Bones in the Middle, by conjoining the external Line or Ridge of the *Tibia* with the internal of the *Fibula*.

CHAP. XXIV.

Of the Bones of the Foot, *properly ſo call'd.*

AS the Hand, properly ſo call'd, conſiſts of Three Parts, *viz.* the *Carpus*, *Metacarpus*, and the *Fingers*; ſo the Foot, properly ſo call'd, has Three Parts anſwerable to it, to wit, the *Tarſus*, the *Metatarſus*, and the *Toes*. Beſides which, it has nevertheleſs another Part, nothing like which is obſervable in the Hand, which conſiſts of Three Bones, to wit, the *Talus*, the *Calcaneus*, and the *Os Naviculare*, ſo call'd from its Figure: And this Fourth Part (which by ſome Anatomiſts is comprehended within the *Tarſus*) we will call the *Innominata*.

Theſe *Three* beforeſaid Bones, as well as the *Four* that belong to the *Talus*, are in their firſt Beginning ſoft, and rather cartilaginous than oſſeous; but in Proceſs of Time acquire a more ſolid Subſtance, which nevertheleſs is full of ſmall Holes like a Pumice-Stone, in the ſame Manner as all the other Bones which are cartilaginous in new-born Infants; though it is obſervable, that even in Infants they are not all alike, but ſome harder than others, eſpecially the *Os Calcis*, which as it is the hardeſt among all theſe Bones, ſo in the moſt tender Age of Infants it keeps a *Medium* betwixt a Cartilage and a Bone.

They all differ very much in their *Figure*; as well as in their *Magnitude*; for the *Cal-*

caneus is the biggeſt of all, the *Talus* is the next, then the *Os Naviculare*, then the *Cuboides*, or *Cubiforme*, and laſt of all the *Cuneiformia*, the *Firſt* of which is call'd the *biggeſt*, the *Second* the *leaſt*, and the *Third* the *middling*, from their different Magnitudes.

The *Talus*, or *Aſtralagus* after the *Greeks*, is a Bone of a various Figure, by means of which the *Tibia* and *Fibula* are join'd together, and by which the Foot has its Flexion and Extenſion, as alſo ſome Motion towards the Sides. This belongs not only to Man, but to all the other Animals alſo, which have Feet or Paws diſtinguiſh'd like our Toes.

It conſiſts of *Six Latera*: The *ſuperior* is almoſt quadrilateral, excepting that the poſterior Line is ſomewhat ſhorter than the anterior, but for the reſt, is incruſtated with a ſoft and ſlippery Cartilage. Its Surface is not plain, but convex and round, in the Middle of which, betwixt the Prominencies, it has a ſlight *Sinus*, in which is inſerted a Ridge, which divides the inferior *Sinus* of the *Tibia* in Two; ſo that the *Tibia* is articulated with the *Talus* by *Ginglymus*.

But the *Two Sides*, one of which is the *interior*, and the other the *exterior*, are on their ſuperior Part, where they receive the *Malleoli*, cover'd with a thin Cartilage; and on their inferior Part they have unequal *Sinus's*, into which are faſten'd the Ligaments which tie the Two Bones of the *Tibia* to the *Talus*: But the *Firſt* of theſe Two has only a ſlender Part, inveſted with a Cartilage; whereas the other has a much larger Part cover'd with it, becauſe the *Fibula*, which forms the *Exterior Malleolus*, deſcends lower than the Proceſs of the *Tibia*, which makes the *Internus*.

The *anterior* Part or Side ſtretches out into an oblong Neck, unto which, on the Foreſide, is united an exact round ſmall Head, which enters into the *Sinus* of the *Os Naviculare*; by the Help of which the Foot is mov'd Sideways. Betwixt this and the *ſuperior* Side is a round pretty deep *Sinus*, into which enters that Protuberancy which ariſes in the Middle of the Ridge of the *anterior Sinus* of the *Tibia*, when the Foot is bent into an acute Angle.

The *poſterior Side*, which is the leaſt of all, and altogether unequal, has on its ſuperior Part a *Sinus*, which extending through the whole Side, receives the Ligament of the *Tibia*; and on its inferior Part has a ſmall deſcending *Sinus*, through which paſs the Tendons of the Muſcles that move the Foot.

The *inferior Part* or *Side*, by Means of which it is conjoin'd with the *Calx*, becauſe on its poſterior Part it was to receive, and on its anterior was to be received, by this Bone, is provided in the Firſt Part with a *Sinus*, and in the latter with a Head, both of which are inveſted with a Cartilage. The Head is round and oblong; but three times ſmaller than the *Sinus*. The *Sinus* ſtretches from the poſterior to the exterior Part obliquely, being not unlike to the *Proceſſus Coracoides* of the *Scapula*. Betwixt theſe Two, where the *Talus* does not touch the *Calx*, there is a long, deep, and pretty broad *Sinus*, and another *Sinus* anſwerable to it near the *Calx*. In this laſt there is gathered a certain mucous Subſtance, which ſerves for the Irrigation and Humectation of the cartilaginous Ligaments which in this Place tie the *Talus* with the *Calx* together, to prevent their being exſiccated in their frequent and long continued Motions.

The *Os Calcis*, the *Calcaneus*, or the *Heel-Bone*, is a Bone ſituated under the *Talus*. Its ſuperior Side receives the *Talus* in Part, to wit, on its anterior Part, where it has a *Sinus* and a *Head*, by which it is articulated with it; but its poſterior Part does not touch the *Talus*; where it has an unequal *Sinus*, which receives a Ligament from the *Tibia*, which keeps the *Talus* ſteady. Both its Sides are ſinuous; the *internal*, becauſe the Tendon of the Firſt oblique Muſcle that moves the Foot, with Two others; as alſo the Veins, Arteries, and Nerves, have their Paſſages there. The *external* Side has a ſmall *Sinus* on its fore Part, which is inveſted with a Cartilage, for the Tendons of the Second oblique Muſcles that move the Foot. The inferior Part is ſomewhat broad, its poſterior ſomewhat convex, provided with ſome ſlight *Sinus's*, for the Inſertion of Two Tendons. On the anterior Part it has a ſmall Prominency, or a broad Head, wherewith it is articulated into the ſuperficial *Sinus* of the *Os Cubiforme*.

The *Os Naviculare*, ſo call'd from its Figure, which is oblong, and hollow within, but

but convex without, is the Third Bone of the *Tarſus*. Its Cavity is inveſted with a thin Cartilage, into which enters the Head of the *Aſtralagus*: But its convex Part being alſo incruſtated, has Three *Sinus's*, which are ſo ſuperficial, that it is almoſt doubtful whether they receive or are received. With theſe are conjoin'd the Three Bones of the *Tarſus*; among which, the biggeſt occupies the internal Part, and the leaſt the external. Its Poſition therefore is in the Middle of the Foot; and by it the main Part of the *Tarſus* is united with the *Talus*.

Next to theſe Three come the Four Bones of the *Tarſus*, which are all plac'd in one Row, the Firſt being join'd with the *Calx*, and the other Three with the *Os Naviculare*. As they are all join'd together they form an Arch, being convex on the ſuperior, and concave on the inferior Part. Nay, even thoſe Three that are articulated with the *Os Naviculare*, are raiſed in the Manner of an Arch, leaving a remarkable Cavity on the Foot, wherein lie concealed both the Tendons and Muſcles, which would be impair'd in Walking, if the Sole of the Foot had been made flat. Theſe Three are call'd the *Cuneiformia*, from their Figure, being broad on the ſuperior, and narrow on the inferior Part. Theſe Bones are conjoin'd together by cartilaginous Ligaments; yet where they are adjacent one to the other they have no Cartilages, but on the anterior Part, where they are articulated with the Bones of the *Metatarſus*; and on the poſterior, where they are with the *Os Naviculare*, they are inveſted with a thin Cartilage.

The Firſt of theſe Four Bones is the *Cubiforme*, ſo call'd from its Six Sides. Its Poſition is before the anterior Part of the *Calx*, wherewith it is conjoin'd on its poſterior Part. On its anterior Part it is articulated with the Fourth and Fifth Bones of the *Metatarſus*, and at its interior with the Fourth of the *Tarſus*. The exterior, ſuperior, and inferior Sides, are not conjoin'd with any other Bone.

The *Cuneiforme Majus* is the Second, which occupies the greateſt Part (among the *Cuneiformia*) of the interior Side of the Foot. It is long and broad before, where it receives the Firſt Bone of the *Metatarſus*. 'Tis a Queſtion, Whether it be ſinuous or prominent? But it rather ſeems to have a Prominency, becauſe the Firſt Bone of the *Metatarſus* has a ſlight and yet a very conſpicuous *Sinus*. The *poſterior* Side has a *Sinus*, into which it receives the ſmall interior Proceſs of the *Os Naviculare*. On its *ſuperior* Part it is *convex*, and at its interior *concave*; but very unequal on both theſe Sides.

The *Cuneiforme Minus* is the Third, being placed in the Middle. Its *ſuperior* Part is ſquare, and a little arched; its *inferior* acute, and its *anterior* and *poſterior* triangular, and inveſted with a Cartilage. At the Firſt it receives the Second Bone of the *Metatarſus*, and at the other it is conjoin'd with the *Os Naviculare*. The Sides are ſquare, but oblong; the interior of which enters the *Sinus* of the exterior Side of the *Os Cuneiforme Primum*; but the *exterior* is conjoin'd with the *interior* of the Third.

The *Cuneiforme Medium* is the Fourth. It is altogether like unto the former, excepting that it is ſomewhat bigger. On its ſuperior Side it is alſo of an oblong quadrilateral Figure. On its inferior it is ſharp, but ſomewhar obtuſe; in the midſt of which is a ſmall Prominency, for the Inſertion of the *Muſculus Tibiæus Poſticus*. On its anterior Part it receives the Third Bone of the *Metatarſus*. On its *poſterior*, the external Protuberancy of the *Os Naviculare* into a ſuperficial *Sinus*. On its Sides it touches the Third and Firſt Bone of the *Tarſus*.

The *Second* Part of the Foot, properly ſo call'd, is the *Metatarſus*, call'd *Pedium* by the *Greeks*. *Celſus* calls it the *Planta*, and others the *Pecten*. It conſiſts of Five Bones; for here the Great Toe challenges one among the reſt, quite otherwiſe that it is in the Hand. They are all of them very ſolid, excavated within in the Nature of a Pipe, and are much longer than the Bones of the *Metacarpus*. They obſerve a certain Proportion in their Magnitude, for that which ſupports the Great Toe is the thickeſt; and among the reſt, that which lies under the next Toe is the longeſt: After which they ſhorten by degrees; but as to their Thickneſs they are very near the ſame.

They terminate at both Ends in ſmall Heads; but the anterior is much ſmaller, than

than the posterior, being round, but a little flat on the Sides. This Head inclines rather upwards than downwards, quite contrary to what is observable in the Hands: But the Head of that which is plac'd at the *Great Toe* is more orbicular than the rest, because it moves more sideways than the other Toes do. The *posterior* Heads are thick on the upper Part, but pointed on the inferior, and flat on the Sides, not unlike a Triangle. They have a slight but conspicuous *Sinus*, invested with a Cartilage. The *anterior* Heads are received into the deep *Sinus's* of the First Joints of the Toes: The *posterior* receive the *Ossa Tarsi*, to wit, the First, that lies under the Great Toe, the *Cuneiforme Majus*; the Second, which lies under the next Toe, the *Cuneiforme Minus*; the Third, under the Middle Toe, the *Cuneiforme Medium*, or *Tertium*; the Two remaining, the Two small Heads of the *Cubiforme*; so that they are articulated by a *Neuter Arthrodia* with the *Tarsus*. That Bone which is plac'd under the Great Toe emits a Process from its inferior Part, for the Insertion of the Tendon of the *Peroneus Primus*; and that which lies near the Little Toe has also a large Process, for the Tendon of the Muscle call'd the *Flexor Secundus Pedis*. The middle Part of these Bones which is betwixt their Heads grows thinner where it recedes from the *Tarsus*, being broad on the superior, and sharp on the inferior Part, their Sides meeting together in an acute Line or Ridge down from the superior Surface; so that an Interval is left betwixt each of them, for the convenient Position of the interosseous Muscles.

There are Fourteen Bones belonging to the Toes, because the Great Toe has but Two, but the rest Three apiece. These Bones differ very little from those of the Fingers, in their Substance, Position, and Structure; but are smaller. They have all of them a solid and concave Substance. They have all Three Internodes, provided with a double Appendage, the anterior of which makes a double Head, and is received also by a double *Sinus* of the First Internodes; but the posterior on the contrary receives. They differ only in this, That their First Joints have deeper *Sinus's*, because into them are articulated the large Heads of the *Metatarsus*.

The *Ossa Sesamoidea* are here also very near in the same Order, Number, and Position, as in the Hand. They differ only in their Magnitude, the small Bones of the Foot being lesser, because the Toes are so.

CHAP. XXV.

Of the Nails.

THE Nails are neither Cartilages, because they will grow again after they are pared; nor Bones, because their Substance is too soft; but of an intermedious Nature betwixt both, as we may call it, being moderately hard and flexible, and of such a Magnitude as is adapted to that of the Extremities of the Fingers and Toes: For they are of a semicircular Figure behind and before, but somewhat broader before; a little convex on the exterior, and concave on the interior, where they lie next to the Flesh. They make up the Number of Twenty, Ten for the Fingers, and as many for the Toes. The Nerves, as well as the Arteries and Veins, pass to the Roots of the Nails; and at the Roots also they are fasten'd by Means of a Ligament; where and at the Sides, they are join'd with, and cover'd by, the Skin, and the Tendons of the Muscles that bend the Fingers lie underneath them; which is the Reason, that when any Corrosives are applied to that Part, it produces most violent Pains. The Nails are transparent, having no other Colour but what they borrow from the subjacent

Plate 1.st

Fig.: I

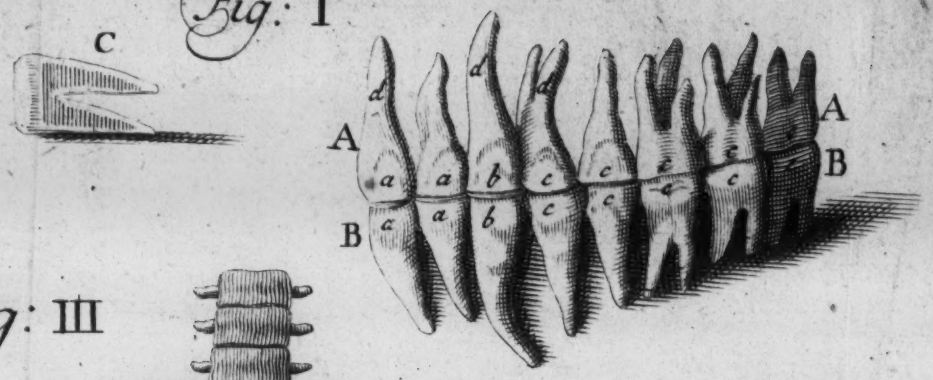


Fig.: IX

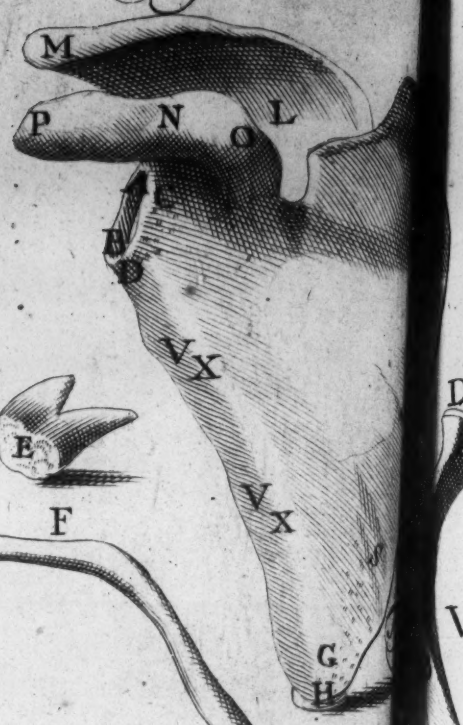
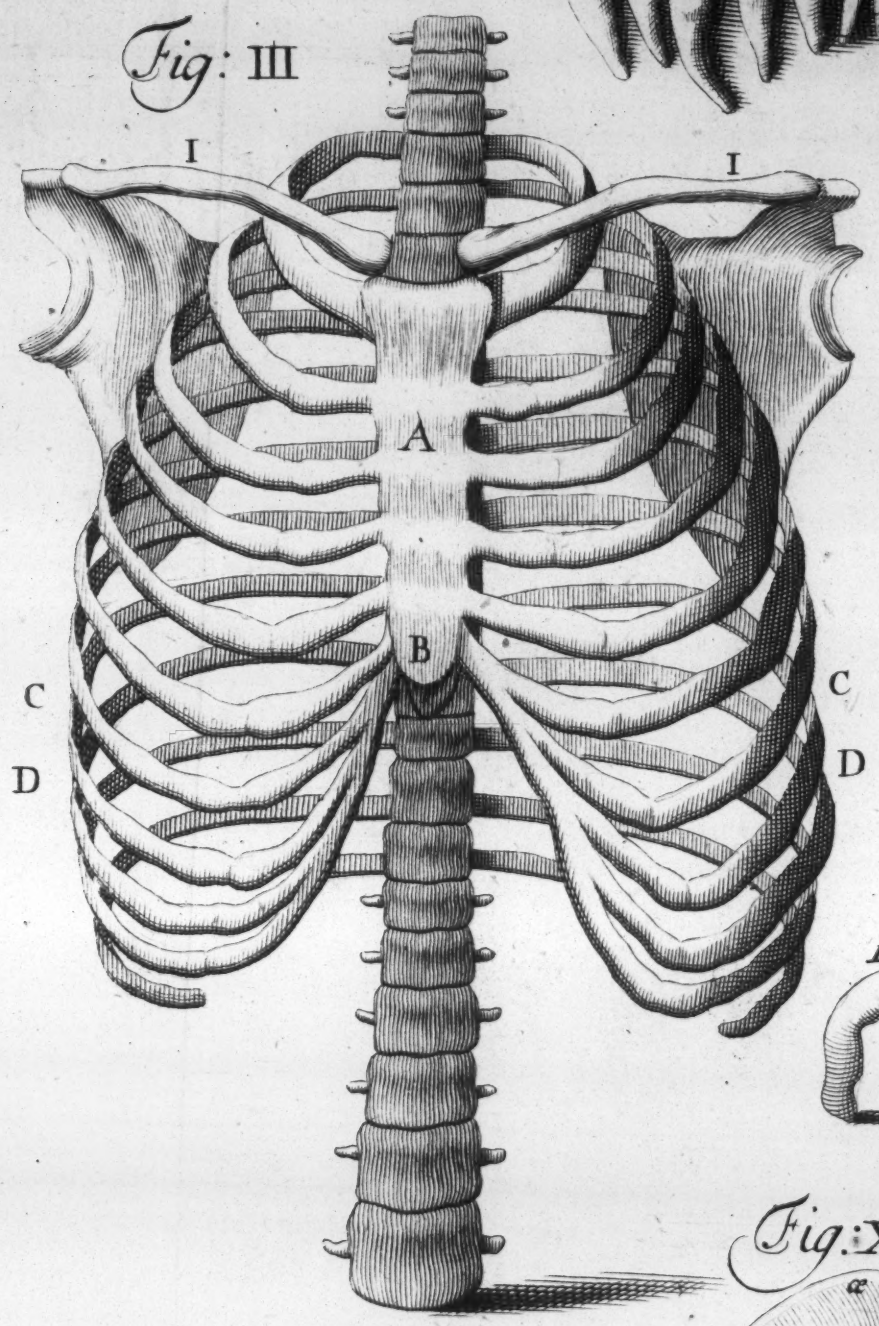


Fig.: III



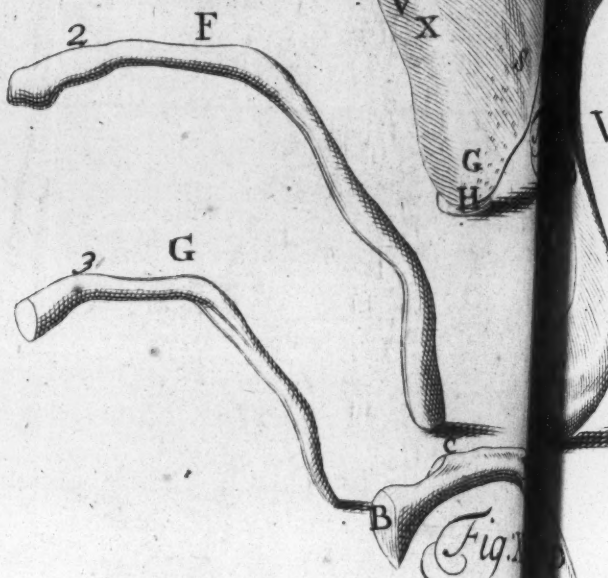


Fig.: VI

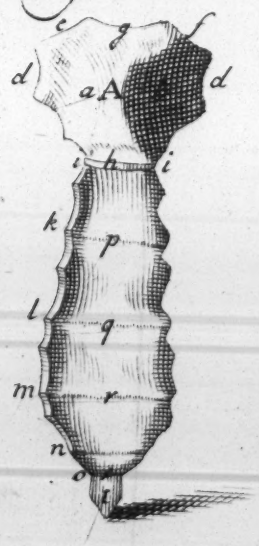


Fig.: VII

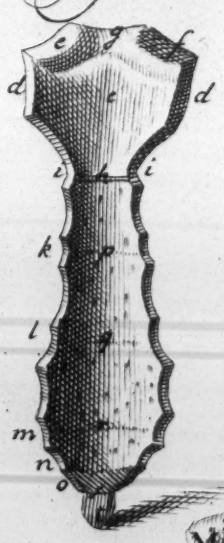


Fig.: XV

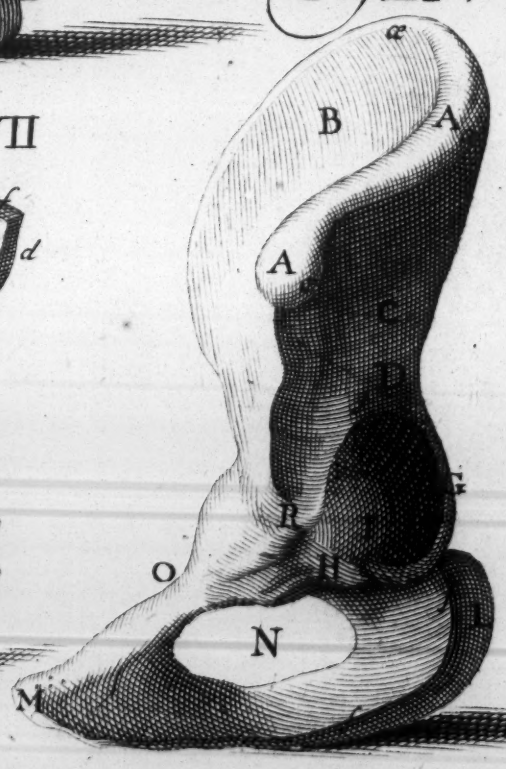
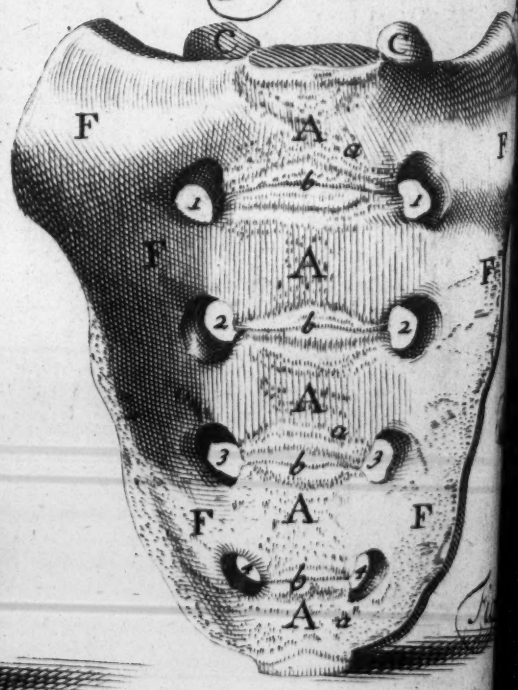


Fig.: XI



Several figures of the Bo

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Fig: VIII

Fig: IV

Fig: II

Fig: XVII

Fig: XII

Fig: XVI

Fig: XIII

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en from Dion. S.t Hillair & Spigelius

t Parts: Whence it is, That the Nails nge their Colour according to the Alte- on of the Temperament; ſo that by their lour we are led unto the Diſcovery of e Diſeaſes. Thus in the *Icterus* they turn yellow; and at the Approach of an Ague they appear of a livid Colour. The Uſe of the Nails is to cover and defend the Extremities both of the Hands and Feet.

Figure I. *ſhews the Teeth of one Side of the Upper and Under-Jaw, taken out of their Sockets; together with their Roots.*

A, A. THE Eight Upper-Teeth of the Right Side.

B, B. The Eight Under-Teeth of the ſame Side.

a, b, c. Repreſent the ſeveral Sorts of the Teeth; *a*, the *Inciſores*; *b*, the *Canini*; and *c*, the *Molares*.

d, d, d. The Roots of the Teeth.

C. The Cavity of a *Dens Molaris* diſſected, being cover'd with a thin Membrane.

D. The interior Surface of a *Dens Inciſorius*.

E. A *Dens Molaris*, the Letter or Character being plac'd upon its Table.

An Explication of the Figures repreſenting the Bones of the Spine. *Taken out of* Dion's *Anatomical Demonſtrations.*

Figure II. 1, 2, 3, 4, 5, 6.

A. The Spine.
B. The *Vertebræ* of the Neck.
C. The Firſt *Vertebra* of the Neck, call'd the *Atlas*.
D. The Wheeling *Vertebra*, or the Second of the Neck.
E. The Axle-Tree, or the Third *Vertebra* of the Neck.
F. The Twelve *Vertebræ* of the Back.
G. The Firſt *Vertebra* of the Back, call'd the *Eminent*.
H. The Eleventh *Vertebra* of the Back, call'd the *Streight*.
I. The Loins.
L. The Firſt *Vertebra* of the Loins, call'd the *Nephritick*.
M. The *Os Sacrum*.
P. The *Coccyx*, or Rump-Bone.

An Explication of the Figures repreſenting the Bones of the Thorax. *Out of* Dion's *Anatomy.*

Figure III. 1, 2, 3, 4.

A. The *Sternum*.
B. The Cartilage *Xiphoides*.
C, C. The Ribs.
D. The Figure of the Ribs.
E. One of the Firſt Ribs.
F. A great Rib.
G. A ſmaller Rib.
H. A Spurious Rib.
I, I. The Clavicles.

All

All the following Figures, as well in this as the next following Plate, are taken out of *Spigelius*'s Hiſtory of the Bones.

Figure IV. *and* V. *repreſent the Left Clavicles; the firſt of the Two the ſuperior and anterior Part, and the latter the inferior and poſterior.*

A, B. The round and convex Part.
B, C. The broad or flat Part.
D. The ſmall Head, which is articulated to the *Sternum.*
E. The ſmall Head, which is articulated with the ſuperior Proceſs of the *Scapula*, or with the *Acromion.*

Figure VI. *and* VII. *repreſent the anterior and poſterior Part of the* Sternum; *the firſt of the Two the anterior, and the latter the poſterior Part.*

A. The Firſt Bone of the *Sternum*, protuberating a little forward.
a, b. A Depreſſion on each Side of this Protuberancy.
c. The poſterior Part of the Firſt Bone, being ſomewhat hollow.
d. The Cavity of the Firſt Bone of the *Sternum*, into which the Cartilage of the Firſt Rib is inſerted.
e, f. The *Sinus's* of the Firſt Bone of the *Sternum*, wherewith the Heads of the *Claviculæ* are articulated.
g. A Sinuoſity betwixt theſe Two *Sinus's*, ſhaped like a Creſcent.
h. The Connexion of the Firſt Bone of the *Sternum* with the Second.
h, r. The Second Bone of the *Sternum.*
i. The *Sinus* which is common as well to the Firſt as to the Second Bone of the *Sternum*, into which the Cartilage of the Second Rib has its Inſertion.
k, l, m, n, o. The *Sinus's* of the Second Bone of the *Sternum*, into which the Cartilages of the Third, Fourth, Fifth, Sixth, and Seventh Ribs are articulated.
p, q, r. The Places mark'd with theſe Letters ſhew us the Diſtinctions which now and then are apparent in Children, as if the Second Bone of the *Sternum* did conſiſt of Three ſeveral Bones.
r, ſ. The Third Bone of the *Sternum.*
t. The *Cartilago Mucronata*, which is coherent with the Third Bone of the *Sternum.*

Figure VIII. *and* IX. *repreſent the Left* Scapula; *in the firſt its exterior Surface, in the latter its interior.*

A, B, C, D. The Firſt Proceſs of the *Scapula*: *A, B.* is the *Sinus* into which the Head of the *Humerus* is articulated; but *C, D.* the Neck.
E, F, G. The *Baſis*, or Firſt *Latus* of the *Scapula.*
E, E. Its ſuperior *Coſta.*
G, D. Its inferior *Coſtæ.*
E, G. The Two Angles of the *Scapula*; *E* is the ſuperior, and *G* the inferior.
H. The cartilaginous Appendage of the inferior Angle.
I, I. The Spine of the *Scapula.*
L, M. The *Summus Humerus*, or the *Acromion.*
M. A ſuperficial *Sinus*, into which the Head of the *Clavicula* has its Inſertion.
N, O, P. The *Proceſſus Ancoriformis.*
O. The *Baſis* of this Proceſs.
P. The *Vertex* of this Proceſs.
Q, R. The *Interſcapulia*; *Q* is the ſuperior, and *R* the inferior.
S, S, S. Certain Prominencies reſembling unto oblique Lines, and forming certain *Sinus's*, as if made by the convex Part of the Ribs.
T, T. A rough *Sinus*, from whence ariſes the *Muſculus Interior*, which extends the Cubit.

V, V. A Protuberancy on the inferior *Coſta*; for which Reaſon it is, that the Part mark'd with *X, X.* has a remarkable Cavity.

Figure X. *repreſents a* Rib *ſingly.*

A. The ſmall Head which is conjoin'd with the *Sternum.*

B. The ſmall round Head wherewith the Rib is articulated into the *Sinus's* of the *Vertebræ.*

C. A Protuberancy, by which the Ribs are articulated into the *Sinus* of the tranſverſe Proceſs of the *Vertebræ.*

D, E. The bony Part is mark'd with *D*; and the cartilaginous with *E.*

F. The inferior and oblong *Sinus* through which the Veſſels take their Paſſage.

Figure XI. *and* XII. *In the firſt of theſe Two is repreſented the anterior and concave Part of the* Os Sacrum, *and in the other its poſterior and convex.*

A, A, A. The Five *Vertebræ* of the *Os Sacrum.*

a, a, a. Shew the ſmall Holes or Poroſities.

b, b, b. The Connexion of the *Vertebræ*, which in adult Perſons are diſcernable only by ſome ſlender Rudiments or Lines.

B. The proper *Foramen* of the *Vertebræ*, through which paſſes the Spinal Marrow.

C, C. The ſuperior oblique Proceſſes of the Firſt *Vertebra*; the *Sinus* of which is indigitated by this Letter.

D, D. Shew the Connexion by which the deſcending Proceſſes of the Firſt Bone of the *Os Sacrum* ſeem to be united with the Aſcendents of the Second; like in the *Vertebræ* of the Loins.

E, E. The poſterior Proceſſes.

F, F. All the tranſverſe Proceſſes conjoin'd with one another.

G. The Body of the Firſt *Vertebra* of the *Os Sacrum.*

1, 2, 3, 4. The *Foramina* of the anterior and poſterior Part, which are bigger and more conſpicuous in the Firſt.

H, H, I, K, L, M, N. Theſe Letters indigitate that Part on the right Side of the *Os Sacrum*, which conjoins it on the right Side of the *Os Ilium*, and is compoſed of divers *Sinus's* and Prominencies. *H, H*, indigitate the oblong anterior *Sinus*; *I, K*, the Two poſterior, which are almoſt round; *I* being the ſuperior, and *K* the inferior. The anterior are divided from the poſterior by the Prominency *L*, which riſes like a broad Ridge; but the Two poſterior, the Protuberancy *M.* The ſuperior *Sinus*, mark'd with *N*, is in the ſuperior Part.

O. The laſt *Vertebra* of the *Os Coccygis* repreſented in the Second of theſe Two Figures, to ſhew how, when the *Os Sacrum* conſiſts of Five *Vertebræ*, this emits its tranſverſe Proceſſes, *c, c*, on both Sides; which ſtretching upwards, *d, d*, are united with the poſterior Proceſs of the Fifth forked *Vertebra* of the *Os Sacrum*, *e, e*, by Means of the Cartilage *f*, where is the *Foramen g*, through which paſſes the Sixth Pair of Nerves of the *Os Sacrum.*

Figure XIII. *and* XIV. *repreſent the* Os Coccygis.

1, 2, 3, 4. The Four ſmall Bones of the *Os Coccygis*; 1 is the uppermoſt, and 4 the lowermoſt.

A. The ſuperior Part of the uppermoſt Bone, being broader than that which is next under it; and ſo with the reſt.

B. The inferior Part, which is narrower than the ſuperior.

C. The *Sinus* of the Firſt *Vertebra*, into which is receiv'd the inferior Part of the laſt *Vertebra* of the *Os Sacrum.*

Figure XV. XVI. *and* XVII. *Theſe Three Figures repreſent, the* First *the anterior, the* Second *the external, and the* Third *the interior Part, of the* Ossa Innominata.

a. The *Sinus* of the *Coxendix*, into which is received the ſuperior Head of the *Femur.*

1, 2, 3. Three cartilaginous Lines, by Means of which the Three *Oſſa Innomonata* are united together. 1 indigitates the Firſt, 2 the Second, and 3 the Third.

1, 2, *A*, *A*, *B*. The *Os Ilium*, circumſcribed by theſe Lines.

2, 3, *Q*, *L*. The *Os Coxendicis.*

1, 3, *M*. The *Os Pubis*, circumſcrib'd by by theſe Lines.

A, *A*. The Spine of the *Os Ilium*, being an unequal Appendage, for the Conveniency of the Muſcles.

a. A Line which diſtinguiſhes the Spine, *A*, *A*, and the *Os Ilium.*

B. The *Coſta*, or Cavity of the *Os Ilium.*

C. The *Dorſum*, or convex Part of the *Os Ilium.*

D, 1, *D*, 2. Three Ridges on the *Dorſum* of the *Os Ilium*, for the Origination of the *Muſculi Glutæi.* *D*, 3. Their Poſition is indigitated by the Numbers.

E, *E*, *F*. Shew that Part of the *Os Ilium* which is conjoin'd with the Prominencies of the tranſverſe Proceſſes of the Firſt and Second of the *Os Sacrum*, and with the *Sinus*, *H*, *H*, *I*, *K*, *L*, *M*, *N*, delineated in the Second of theſe Three Figures; for *E*, *E*, is the oblong anterior Prominency; the Two other poſterior and acute, *b*, and *c*. Theſe, as well as the Firſt, are diſtinguiſh'd by an oblong *Sinus*, *F*; but theſe, to wit, *b*, and *c*, are diſtinguiſh'd by the *Sinus d.* Near the ſuperior, *b*, is another *Sinus*, *e*. *E*, *E*, enters the *Sinus H*, *H*, and *B*, *I*, *&c.* *K*, and *N*, the *E*. And again, the *Sinus F* receives the Prominency *L*; *d* the *M*; and *c* the *N*.

G. The Lips of the great *Sinus* of the *Coxendix*, which are more conſpicuous in the poſterior than in the anterior Part, and in the ſuperior more than in the inferior.

H. In this Part where the *Sinus* of the *Coxa* looks towards the *Oſſa Pubis*, theſe Lips are not extant.

I. The anterior Part of the *Sinus Coxendicis*, without a Cartilage.

K. The *Sinus* of the *Os Coxendicis*, for the Third Muſcle that turns the *Femur.*

L. The Appendage of the *Os Coxendicis.*

f. A Line which diſtinguiſhes the *Os Coxendicis* from the Appendage.

M. A thick rugged Line, by which the *Oſſa Pubis* are join'd together.

N. The *Foramen* of the *Oſſa Pubis.*

O. The *Sinus* in the *Os Pubis*, for the Paſſage of the crural Veſſels.

P, *Q*. Two Protuberancies of the *Os Coxendicis*; *P* is the exterior, and *Q* the interior.

R. A *Sinus* in the ſuperior Part of the *Os Coxendicis*, for the Progreſs of the Firſt and Second *Muſculi Flexores Femoris.*

In the Second PLATE.

Figure I. *and* II. *repreſent the* Os Humeri *of the right Arm; the firſt ſhews the anterior, and the other the poſterior Part. We have in the Delineations of all the following Bones repreſented alſo the Appendages, as they are conjoin'd with, and conſpicuous in the Bones.*

A The ſuperior Appendage of the *Os Humeri.*

B, *B*. The inferior Appendage of the *Os Humeri.*

a, *b*. The Two Heads of the ſuperior Appendage; *a* the interior, and *b* the exterior.

c, *d*. the Two Parts of the exterior Head; *c* the anterior, and *d* the poſterior.

e. A

Plate 2.d

Fig: X

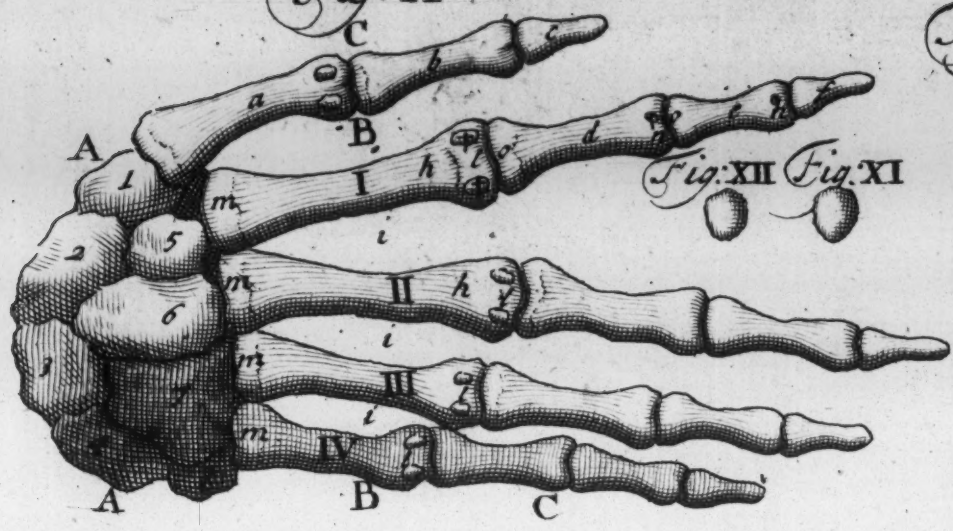

Fig: V

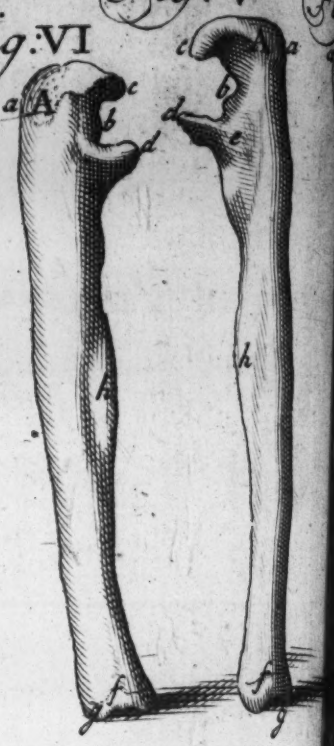

Fig: VI

Fig: XXIII

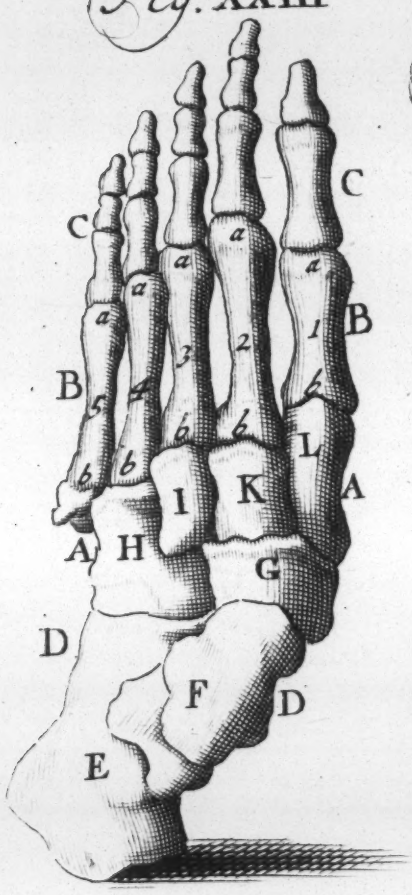

Fig: XXXVIII

Fig: XXXVII

Fig: XXXVI

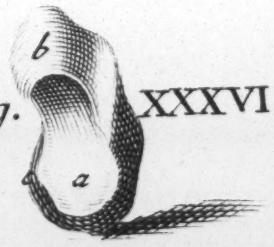

Fig: XVIII

Fig: XVII

Fig: XV

Fig: XXXIV

Fig: XXXII

Fig: XXXIII

Fig: XXXV

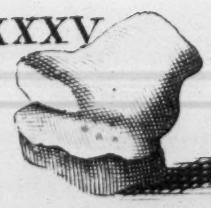

Fig: XXIX.

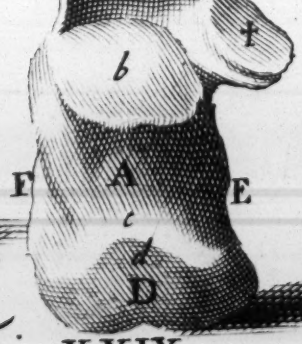

Fig: XXX.

Fig: III. Fig: II Fig: I

Fig: IX

Fig: VII

Fig: XX. Fig: XIX

Fig: XXIV.

Fig: VIII

Fig: XVI. Fig: XV. Fig: XIV. Fig: XIII.

Fig: XXII. Fig: XXI

Fig: XXVII

Fig: XXVIII

Fig: XXVI

Fig: XXV

Severall figures of Bones done from Spigelius

A round *Sinus*, which diſtinguiſhes the exterior Head into Two Parts.

The round Part of the *Os Humeri*, on its anterior Part.

Its broad poſterior Part.

That Part of the *Os Humeri* where it grows very broad.

i. The inferior and interior Head of the *Os Humeri*, for the Articulation of the *Cubitus*.

l, *m*. The Two *Trochleæ*; *l* the anterior, *m* the poſterior: The Firſt receives the inferior, and the other the ſuperior Proceſs of the Appendage of the *Cubitus*.

n. The inferior and exterior Head of the *Os Humeri*, which is articulated with the *Radius*.

o, *p*. Two Protuberancies of the *Humerus*; *o* the interior, *p* the exterior.

q, *r*. Two *Sinus's* at the Sides of the ſmall Protuberancies; *q* at the exterior, and *r* at the interior Side.

ſ. The ſmall *Foramina*, for the Inſertion of the Ligaments of the *Humerus* with the *Scapula*.

t. A *Foramen* in the Middle of the Length of the *Os Humeri*, for the Vein that penetrates into its interior Subſtance.

Figure III. *and* IV. *repreſent the Two Bones of the* Cubitus, *to wit, the* Ulna *and the* Radius *of the Right Arm, conjoin'd in their natural Poſition, to wit, the firſt the anterior, and the other the poſterior Part. The Characters are the ſame as in the Four following Figures.*

Figure V. *and* VI. *repreſent the anterior and poſterior Part of the* Ulna *of the right Arm.*

A. The ſuperior Appendage of the *Ulna*.

a. The convex Part of the *Ulna*.

b. The *Sinus Sigmoides* of the *Ulna*.

c, *d*. Two Proceſſes of the *Sinus b*; the poſterior *c*, and the anterior *d*.

e. The *Sinus* that makes the Fourth Part of the *Cubitus*, and receives the leſſer Head of the *Radius*.

f. The inferior Appendage of the *Ulna*. It is conjoin'd with the reſt of the Bone.

g. The *Proceſſus Styloides* of this Appendage.

h. The ſharp Ridge of the *Ulna*.

Figure VII. *and* VIII. *repreſent the anterior and poſterior Part of the right* Radius.

i. The Neck of the *Radius*.

l. The ſuperior Appendage of the *Radius*.

m. The *Sinus's* belonging to this Appendage.

n. That Part where the ſaid Appendage is inſerted into the *Sinus* of the *Ulna*.

o. An oblong Prominency, with a rough *Sinus*, for the Tendon of the *Muſculus Biceps*.

p. The inferior Appendage of the *Radius*.

q. The *Sinus*, into which is received the inferior Appendage of the *Ulna*.

r. The rough Line or Ridge of the *Radius*.

Figure IX. *and* X. *repreſent the external and internal Part of the right Hand.*

A, *A*. The Eight Bones of the *Carpus*. Their Poſition is indigitated by the Numbers, 1, 2, 3, *&c.*

B, *B*. The Four Bones of the *Metacarpus*. Their Poſition is ſhewn by the *Roman* Numbers, I, II, III, *&c.*

C, *C*. The Fifteen Bones of the Fingers.

a, *b*, *c*. The Bones of the Thumb; *a* the Firſt, *b* the Second, and *c* the Third.

d, *e*, *f*. The Bones of the *Index*; *d* the Firſt, *e* the Second, and *f* the Third: And ſo with the other Bones.

g, h. The Surface of the Bones of the *Metacarpus*; *g* is the exterior and plain, and *h* the interior and acute.

i, i, i. The Interſtices betwixt the Bones of the *Metacarpus.*

l, m. The Appendages of the Bones of the *Metacarpus*; the ſuperior of which has a ſmall Head, the inferior a *Sinus.*

n, o. The Appendages of the Bones of the Fingers; *n* the ſuperior, *o* the inferior.

† †. The Poſition of the *Oſſa Seſamoidea.*

Figure XI. *and* XII. *repreſent the exterior and interior Part of the* Oſſa Seſamoidea.

The following Figures repreſent all the Bones of the *Leg*, with their Appendages, as they are conſpicuous in Children.

Figure XIII. XIV. XV. *In the firſt of theſe Three is repreſented the anterior Part of the Left* Femur, *in the ſecond the poſterior, and in the third the lateral.*

A. The Neck of the ſuperior Appendage of the *Femur.*

B. The ſuperior Head of the *Femur*, which enters the *Acetabulum* of the *Coxendix.*

C. The *Foramen* in the Middle of this Head, into which is inſerted the round Ligament that has its Riſe in the Cavity of the *Acetabulum.*

D. The *Trochanter*, or the larger exterior Proceſs.

E. The *Trochanter*, or the leſſer and interior Proceſs.

a. A *Sinus* on the interior Part of the exterior Proceſs.

1, 2, 3, 4. The Four Impreſſions on the exterior Proceſs.

F. A Ridge which deſcends from the Firſt of theſe Impreſſions.

G, H. The Two inferior Heads of the *Femur*; *G* the interior, and *H* the exterior.

I, K. Two *Sinus's* betwixt the Two inferior Heads of the *Femur*; *I* is the anterior, which receives the *Patella*, and *K* the poſterior, for the round Ligament.

b, b. The *Foramina* near the inferior Appendage, deſign'd for the Implantation of the Ligaments.

c, c. A *Foramen* on the poſterior Part of the *Femur*, through which paſſes a Vein for the Nouriſhment of the Bone.

d, d. The Line or Ridge that runs through the poſterior Part of the *Femur.*

e, e, e, e. The Lines which ſhew the Coalition of the Four Appendages, to wit, the Two Heads of the *Femur*, and the Two *Trochanters*, with the reſt of the Bone.

Figure XVI. *ſhews the* Os Tibiæ *of the left Side, conjoin'd with the* Fibula *on its anterior Part. The Characters are the ſame with thoſe in the Two following Figures.*

Figure XVII. *and* XVIII. *The firſt of theſe Two repreſents the interior lateral Part of the* Tibia, *the other the poſterior.*

A. The ſuperior Appendix of the *Os Tibiæ.*

B, B. The Two *Sinus's* of the ſuperior Appendage of the *Tibia*, which receives the inferior Heads of the *Femur.*

C. The Prominency betwixt theſe *Sinus's*, into the Point of which is implanted the round Ligament of the *Femur.*

D. A ſmall Head which enters the *Sinus* of the ſuperior Appendix of the *Fibula.*

E, E. The *Foramina* in both the Appendages of the *Os Femoris.*

F. A Prominency, into which is inſerted a Tendon made by the Tendons of ſeveral other Muſcles.

G. A *Foramen* in the poſterior Part, through which a Vein penetrates into the moſt interior Part of the Bone.
H. The inferior Appendix of the *Os Tibiæ.*
K, K. A double *Sinus* in this Appendage.
L. A Proceſs of the inferior Appendix of the *Tibia*, which forms the *Malleolus internus.*
M. A *Sinus* on the exterior Side, which receives the inferior Appendage of the *Fibula.*
N. A Line or Ridge on the poſterior Part of the *Tibia.*
1, 2, 3. The Three Lines or Ridges of the *Tibia*, which make as many Sides.
I, II, III. The Three Sides of the *Tibia.*
a. Shews the Coalition of both the Appendages with the Bone.

Figure XIX. *and* XX. *repreſent the anterior and poſterior Part of the* Fibula, *with their Appendages, as they are conſpicuous in Children.*

M. The ſuperior Appendage of the *Fibula.*
N. The inferior Appendage of the *Fibula*, which forms the *Malleolus Externus.*
O. That Part of the *Fibula* which is betwixt both the Appendages.
P. The *Sinus* that receives the ſmall Head *D.*
1, 2, 3. The Three Ridges or Lines of the *Fibula.*
I, II, III. The Three Sides of the *Fibula.*
a. The Coalition of the Appendages with the Bone.

Figure XXI. *and* XXII. *The firſt of theſe two Figures ſhews the anterior Part of the* Patella, *which is full of Holes, and the other the poſterior, which is inveſted with a thin Cartilage.*

Figure XXIII. *and* XXIV. *The firſt of theſe two Figures repreſents the mutual Connexion of the Bones of the right Foot on the ſuperior, and the other on the inferior Part.*

A, A. The *Tarſus*, or the Firſt Part of the Foot.
B, B. The *Metatarſus*, or the Second Part of the Foot.
C, C. The Toes, which make the Third Part of the Foot.
D, D. The Fourth Part, or the *Innominata.*
E. The *Calcaneus.*
F. The *Talus*, or *Aſtralagus.*
G. The *Os Naviculare.*
H. The *Os Cubiforme.*
I. The *Os Cuneiforme Medium.*
K. The *Os Cuneiforme Minus.*
L. The *Os Cuneiforme Majus.*
1, 2, 3, 4, 5. The Bones of the *Metatarſus.*
a, b. Two Appendages of the *Oſſa Metatarſi*; *a* is the ſuperior, *b* the inferior.
c, c. The *Oſſa Seſamoidea* in their Poſition.

Figure XXV. XXVI. XXVII. XXVIII. *The firſt of theſe Four Figures repreſents ſuperior Side of the* Aſtralagus *of the right Foot, the ſecond the inferior, the third the external lateral, the fourth the internal: The other two are alſo conſpicuous.*

A, B, C, D, E, F. The Six Sides of the *Aſtralagus*; *A* is the ſuperior, *B* the inferior, *C* the anterior, *D* the poſterior, *E* the internal lateral, and *F* the external.
b. Two Lines or Ridges of the ſuperior Side; *a* the foremoſt, and *b* the hindermoſt.
c. A ſlight *Sinus* within the ſuperior Side, in which is inſerted the Ridge that diſtinguiſhes the inferior *Sinus* of the *Tibia* into Two Parts.
d, d. The Cartilage which covers the lateral Parts where they receive both the *Malleoli.*
e, e, 15, 16. The

e, e. The unequal *Sinus* of the Two lateral Parts, into which are implanted the Ligaments which conjoin the Two Bones of the *Tibia* with the *Talus.*

f. The oblong Neck of the anterior Part.

g. The ſmall Head on this Neck, which is received into the *Sinus* of the *Os Naviculare.*

h. The *Sinus* betwixt the Neck and the ſuperior Side.

i. The tranſverſe *Sinus* ſtretching thro' the poſterior Side.

l. The inferior *Sinus* of the poſterior Side.

m. The *Sinus* of the inferior Side.

n. The Head of the inferior Side.

o. A long and deep *Sinus* of the inferior Side, which contains a mucous Subſtance.

p. A ſlight *Sinus* of the Head, in the inferior Side, which receives the Second Head of the *Calcaneus.*

Figure XXIX. XXX. XXXI. *The firſt of theſe Three Figures repreſents the ſuperior Part of the* Calcaneus *of the right Foot, the ſecond the inferior, and the third the interior.*

A, B, C, D, E, F. The Six Sides of the *Calcaneus*; *A* the ſuperior, *B* the inferior, *C* the anterior, *D* the poſterior, *E* the interior, and *F* the exterior.

a. A *Sinus* in the anterior Part of the ſuperior Side.

b. The Firſt Head in the ſame Part of the ſame Side, which enters the *Sinus m* of the *Talus.*

†. The other Head, which enters the *Sinus* of the ſame *Talus, p.*

c. A *Sinus* on the ſuperior Side, in the poſterior Part, which receives a Ligament from the *Tibia.*

d. The ſmall *Sinus's* in the poſterior Side, for the Inſertion of a *Tendon* of the Firſt and Second Muſcles that extend the Foot.

e. The anterior Part, where it is articulated with the *Os Cubiforme.*

Figure XXXII. *and* XXXIII. *The firſt of theſe Two ſhews the* Os Naviculare *on its poſterior, and the other on its anterior Part.*

A. The Cavity of the *Os Naviculare*, into which enters the Head of the *Talus.*

B. Its convex Part, diſtinguiſh'd by Three *Sinus's*, mark'd 1, 2, 3.

Figure XXXIV. *and* XXXV. *ſhew the ſuperior and inferior Part of the* Os Cubiforme.

Figure XXXVI. *repreſents the* Os Cuneiforme Majus.

a. The *Sinus* which receives the interior Proceſs of the *Os Naviculare.*

b. Its ſuperior convex Side.

c. Its interior concave Side.

Figure XXXVII. *ſhews the* Os Cuneiforme Medium.

a, b, c. Its Sides; *a* the ſuperior quadrilateral Part, *b* the interior pointed, *c* the poſterior, and *d* the interior.

Figure XXXVIII. *repreſents the* Os Cuneiforme Minimum. *The Characters are the ſame as in the next preceding Figure.*

Of

Of the *CARTILAGES* and *LIGAMENTS*. Taken out of *Adrian Spigelius*'s Work of the Fabrick of the *Humane Body*.

CHAP. I.

Of the Nature, Uſe, and Difference, of the Cartilages.

THERE is nothing in the humane Body that approaches ſo near either to the *Subſtance* or the *Uſe* of the Bones, than the Cartilages. In their Subſtance, becauſe all the *Apophyſes* and moſt of the Bones of young Infants are cartilaginous, and afterwards degenerate into Bones. And as to their *Uſe*, it is very near the ſame with the Bones, they being deſign'd for the Support of the ſofter Parts, juſt as the Bones are.

A Cartilage is a ſimple, hard, and dry, but flexible Part of our Body, made for the Strengthening and Security of the ſofter Parts, and to check the Force or Violence of any external Things. I call it a Part, becauſe it is a Body coherent to the Whole, and nouriſhed with it, deſign'd for ſome Uſe or Action; but I call it a *ſimple* Part, becauſe the Cartilage is a ſimilar Part, being every where alike to it ſelf, every minute Part of a Cartilage being of the ſame Nature, and bearing the Name of a Cartilage. 'Tis *hard* and *dry*, by which it is diſtinguiſh'd from all the other ſimilar Parts; and to diſtinguiſh it alſo from the Bone, we have added its *Flexibility*. Their *Uſe*, to wit, *the Strengthening and Security of the ſofter Parts*, is added alſo, becauſe it ſerves for a Foundation like the Bones, which conſiſts in this, That the Cartilage adds to the *Strength*, *Streightneſs*, and *Figure*, of the *ſofter Parts*; for, becauſe our Body could not ſubſiſt without the ſoft Parts, and theſe were not in a Condition to ſupport themſelves, therefore provident Nature has conjoin'd the *harder* Part with the ſofter. And though the Bones perform the ſame Function, in reſpect to the ſofter Parts, the Cartilage does it with more Security; ſo that, in this Reſpect, the *Cartilage* is diſtinguiſh'd alſo from the Bone; for which Reaſon we have added the Words, *To check the Force of external hard Things*. For the Bones being of a very hard Subſtance, are apt to be broken by any exterior hard Body; whereas the Cartilages being moderately hard and flexible, give way, and conſequently put a Check, to any external Force: And this is the Reaſon why we ſee thoſe Parts that are moſt expoſed to external Injuries, as the Noſe, the Ears, to be of a cartilaginous Subſtance. The Uſe of the Cartilages is moſt obſervable in the *Larynx*, or the Head of the *Aſpera Arteria*, which being all cartilaginous, abundance of Muſcles have their Originations and Inſertions there.

There are alſo, beſides this, certain ſecundary Uſes belonging to the Cartilages: *Firſt*, They cover the Extremities of the Bones, which are conjoin'd by a laxe Articulation. *Secondly*, They ſerve for a Rampire or Fence to the ſubjacent Parts. This Function belongs alſo to the Bones; but with this Difference, that the Cartilages are

placed

plac'd where a flexible Fence was requir'd. Thus it is with the Cartilages of the *Sternum*, and of the *Ribs*. *Thirdly*, They conjoin or tie the Bones together: Thus the *Ossa Pubis* are join'd together by a Cartilage; and the Ligaments of many of the Bones are cartilaginous; such are the Ligaments that conjoin the Bodies of the *Vertebræ*, as also those round ones which are in the Joint of the *Femur* with the *Coxendix*, and in the other with the *Tibia*.

But there is a great Difference betwixt the Cartilages themselves: *First*, In Reference to their *Temperament*; for though all the Cartilages be *cold* and *dry*, yet some are drier than others, and consequently harder; for some are *hard*, to wit, those that at last degenerate into Bones, such are those Four that form the *Larynx*; others *soft*, as those that tie the Joints together, and perform the Functions of Ligaments; and others again are of a medious Nature, betwixt hard and soft, and never turn into Bones, such are the *Epiglottis*, and the Cartilages of the Eye-lids.

Secondly, In Respect to the *Age*: In Children all the Cartilages are softer; but in aged Persons on the contrary they are indurated by degrees; so that they become friable and brittle like the Bones.

Thirdly, In Regard to the *Sex*; for in Women the Cartilages are softer than in Men, excepting those Cartilages of the Ribs that are under their Breasts, which as the Breasts increase in Bulk, turn osseous, the better to sustain their Weight. Hot Diseases, such as burning Fevers, *&c.* do indurate and exsiccate the Cartilages.

There is also a considerable Difference betwixt them in Respect of their Figure; according to which they have also obtained various Names. Thus the Cartilage that is plac'd under the Breast-Bone is call'd the *Ensiformis*; thus the Cartilages of the *Larynx* have obtain'd different Names: One of them is call'd the *Scutiformis*, another the *Annularis*, another the *Guttalis*. Some are semicircular, as the Cartilages of the Eye-lids, and those that are in the *Bronchia* of the Lungs, call'd *Sigmoides*, from the *Greek* C.

They differ also in their *Magnitude*; for some are large, others small, some betwixt both. Those of the *Larynx* are large, those of the *Bronchia* small, those of the Eye-lids betwixt both. Among the large ones, some are long, as those of the Ribs; some broad, as those of the *Auricula*: And among the small ones, some are short, others narrow.

In Reference to their *Surface*, most of those which invest the Extremities of the Bones are smooth and bright. Some have an unequal Surface, for the Originations and Insertions of the Muscles, as the Cartilages of the *Larynx*. They are as many in Number as was requisite: However, Infants have more than young Men, and these again more than aged People, because in them they turn often into Bones.

But their main Difference lies in their Situation, which is adapted to their respective Functions. Thus some are *superior*, *inferior*, *anterior*, *posterior*, *interior*, *exterior*, *Right*, and *Left*, in Respect to the whole Body: But as to their *Connexion* with the adjacent Parts, it is much more different; for some of the Cartilages are not conjoin'd with any other Part: Others are join'd with the adjacent as well Cartilages as Bones. Thus the Cartilages of the Eye-lids and of the *Auricula* are not join'd with any other Part: The *Scutiformis* and *Guttalis* with the *Annular*, being all join'd with Cartilages; but they are frequently conjoin'd with the Bones. Such are all those that invest the *Heads* and the *Sinus's*.

This last Connexion is made either by *tying* the Bones together in the Nature of a Ligament, as those that join the *Ossa Pubis* together; or by *growing* to them, as the Cartilages of the Nostrils to the Bones of the Nose, and the *Cartilago Ensiformis* to the *Sternum*; or else by *Articulation*, as the Cartilages of the Ribs with the Breast-Bone, by an *Arthrodia*.

For though this Kind of Articulation is not so exactly observable in the Cartilages as in the Bones, because they are fewer in Number than the Bones, and design'd for other Uses than for Articulations; nevertheless, in those which perform the Functions of Bones, there are most evident Marks of Articulations. Thus the *Arthrodia* is manifestly discernable in the Articulation of the Ribs with the *Sternum*; as also in the *Cartilago Scutiformis* with the *Annular*.

Thus

Thus the *Symphyſis* is conſpicuous in the Cartilages of the Noſe with its Bones, which is made without an intermediate Subſtance; as the Connexion which is made by an intermedious Body, is very evident in the ſemicircular Cartilages in the *Bronchia* of the *Aſpera Arteria*.

Thus much of the Cartilages in general: We will now proceed to a more particular Account of them. But ſince we had Occaſion to ſpeak of thoſe of the Cartilages which are plac'd at the Extremities of the Bones, or in the *Sinus's* of the Joints, in the preceding Treatiſe of the Bones, we will (to avoid Prolixity) treat at this Time of ſuch Cartilages only as are deſign'd for ſome other Uſe, and which have not been treated of before.

CHAP. II.

Of the Cartilages of the Superior Venter, *or the* Head.

THE Cartilages of the Head may properly be reduc'd under Three Heads, to wit, the Cartilages of the *Eye-lids*, of the *Noſe*, and of the *Ears*.

The *Eye-lids* are provided with Two Cartilages, each of them one; ſo that one is the ſuperior, the other inferior. Among theſe, the *ſuperior* is larger in Men, but leſſer in Birds. They are call'd *Cilia* by the *Latins*, and are plac'd at the Extremities of the Eye-lids, betwixt the Skin and the Membrane that covers the Eye-lids, in the Form of a Creſcent. The Uſe of theſe Cartilages is to extend moderately the Eye-lid, and to keep it expanded; for without it, when the Eye-lids are corrugated, when we ſhut our Eyes, they would not have been able to make that equal Compreſſion that they make now. *Fallopius* has diſcover'd another Cartilage in the interior and ſuperior Part of the *Orbit* of the Eye, unto which he has given the Name of *Trochlæa*, or a Pulley, from its Figure: Of which we ſhall have Occaſion to ſpeak more hereafter in the Hiſtory of the Muſcles.

The *Noſe* has Five Cartilages: (1.) The cartilaginous *Septum* or Partition, which beginning at the oſſeous Partition, divides the Noſe into Two Parts. (2, & 3.) Are plac'd at the Sides; which beginning at the broad and inferior Part of the Two Bones of the Noſe, are pretty thick and hard, but grow ſlenderer near the Extremity of the Noſe. (4. & 5.) Have their Poſition in the lower-moſt Part of the Noſe, and cover the Extremities of the beforeſaid Cartilages, each of them terminating in one of the Cavities of the Noſe, which they keep expanded. They are join'd to one another under the cartilaginous *Septum* by Means of the Skin and the Membranes, and ſurround both the Cavities of the Noſe, forming its *Alæ*. They are of a harder Subſtance than the cartilaginous *Septum*, and of a ſemicircular Figure, the incurvated Part being turn'd towards the cartilaginous *Septum* of the Noſe; but that which makes the *Alæ*, ſofter, and almoſt ſemicircular. Sometimes they are diſtinguiſhable into Two Parts; ſo that the Part which forms the *Alæ* is evidently diſcernable from that which is ſituated under the cartilaginous *Septum*: And then the Noſe has Seven Cartilages in all.

The *Auricula*, or *exterior Ear*, is of a cartilaginous Subſtance on its ſuperior Part, call'd the *Pinna*, but carneous on its inferior, call'd the *Lobus*. It was made cartilaginous, that it might be the better able to ſupport it ſelf by its *Hardneſs*, and by its *Flexibility* defend it ſelf againſt external Injuries. It has its Riſe in that *Foramen* of the *Meatus Auditorius*, which is very conſpicuous in the *Oſſa Temporum*; from whence they are expanded in a continued orbicular Cartilage. At its Firſt Riſe it is both hard and thick; but by degrees, as it is more remote from its Beginning, it grows thinner and ſofter. This Cartilage has various Circumvolutions,

being ſometimes convex, ſometimes concave; each of which have their peculiar Names; of which we have given an Account in that Part of the Firſt Tract, where we ſpoke of the Denominations of the *External Ear.*

CHAP. III.

Of the Cartilages of the Middle *and* Inferior Venter *of the Body.*

THE Lungs are plac'd in the middle Concavity of the *Thorax*; and the *Aſpera Arteria*, which belongs to them, ſeems to conſiſt almoſt wholly of Cartilages. This *Arteria* is divided into its *Head*, or the *Larynx*, and into its fiſtulous Part, or the Pipe.

The *Larynx* conſiſts of Four Cartilages, over which is plac'd the Fifth, call'd the *Epiglottis*. The *Firſt* of theſe is call'd the Cartilage *Thyroides*, or *Scutiformis*; the *Second* the *Cricoides*, or *Annularis*; and the *Third* and *Fourth* the *Guttales*, or *Arytænoides*.

The *Firſt* Cartilage, call'd *Thyroides*, or *Scutiformis*, having obtained its Denomination from its Figure, which reſembles unto a Shield, is the biggeſt of all thoſe that belong to the *Larynx*. Its Poſition is on the anterior Part; ſo that in living People it may be reach'd with the Hand or Fingers; and in Males, of a dry and lean Diſpoſition it is conſpicuous on the Outſide, being that which is commonly calld the *Adam's-Apple*. This is a ſingle Cartilage, convex on the Outſide, and concave within, reſembling on one Side unto a *Quadrilaterum*, which is longer on one Side than the other, excepting that in the Middle; on its ſuperior and anterior Part, it has a ſmall Chink, and at its Extremities its Proceſſes: For its Proceſſes are plac'd at each of its Extremities, to wit, Two on the ſuperior, and Two on the inferior Part. By the *Firſt* of theſe, which are long, it is conjoin'd with the inferior Sides of the *Os Hyoides*, by an intermedious oblong Ligament; but by the latter, which are ſhorter, it is articulated with the Second Cartilage, or the *Cricoides*, by an *Arthrodia*, becauſe theſe Proceſſes, with their flat ſmall Heads, enter the ſuperficial *Sinus's* of the *Cricoides*; ſo that the Cartilage *Thyroides* has a manifeſt Motion, by the Help of which the *Larynx* is either dilated or contracted.

The *Second* Cartilage, call'd the *Cricoides*, is ſmaller than the former. It has obtained the Name of *Annularis*, from its Figure. 'Tis call'd alſo the *Innominata* by ſome. This Cartilage may very properly be call'd the *Baſis* of all the other Cartilages of the *Larynx*, becauſe it is plac'd in the lowermoſt Part, and ſupports the reſt: For, becauſe they could not be ſuſtain'd by the Cartilages of the *Pipe*, (they being too weak) nor be articulated with them, (they being too thin) the *Cricoides* was form'd for both theſe Functions; and at the ſame time to keep the *Larynx* always open. In its anterior Part it is convex, ſlender, and of a ſemicircular Figure; but on its poſterior, broader, bigger, and ſmooth: In the midſt whereof is a Kind of a Ridge, call'd the *Spina Innominata* of the Cartilage, by *Galen*.

The *Third* and *Fourth* Cartilages, call'd the *Arytænoides*, are the ſmalleſt of all, reſting upon the ſuperior and poſterior Part of the *Cricoides*, in the Cavity of the *Thyroides*. They are articulated with the *Cricoides* by *Ginglymus*; ſo that they are capable of Flexion and Extenſion both ſtreight forward and to the Sides, and ſhutting up as well as of opening the Chink. They are call'd the *Guttales*, becauſe they are not unlike a Gutter, if you take a View of them whilſt the ſuperior Proceſſes of each of them are as yet incloſed within the common Membrane. There are Two of them; for thoſe that have made only One of them, have been miſguided by this Membrane, which ſerving as an Involucre to both, hides as it were their ſeparate Subſtance. They have alſo their

their *ſuperior* and their *inferior* Proceſſes. The *ſuperior* being ſoft and laxe, and recurvated outward, when they are conjoin'd, reſemble exactly to a Gutter; but the *inferior* form the *Rimula*, or *Glottis*.

Above all theſe, within the *Thyroides*, is plac'd another very ſoft Cartilage, call'd the *Epiglottis*, from its Poſition above the *Glottis*, or *Rimula*, not unlike an Ivy-Leaf; and being ſomewhat rigid and erected, gives a free Paſſage to the Air that goes into the Lungs; but on the other Hand, being not a little flexible when preſs'd downwards by the Weight of Aliments, ſhuts up the *Rimula*, and thereby prevents any thing from falling or paſſing into the *Arteria Aſpera*.

The *Fiſtula* of the *Aſpera Arteria*, or the Wind-Pipe, is the Second Prrt of this *Arteria*, call'd Βρόγχον, from its Irrigation, becauſe the Ancients believ'd that this was the common Paſſage for Liquids, as the ſolid Aliments paſs'd into the Stomach. It is a Compoſition of many Cartilages conjoin'd with one another by the Means of Membranes. Theſe Cartilages are of an annular Figure, thin, and pretty broad; yet are not quite circular, but want about a Fourth Part of a compleat Circle, on that Side where they look towards the Back, and touch upon the *Oeſophagus*; whence they have given them the Name of *Sigmiformes*, from the C of the *Greeks*: However, that Fourth Part is made or fill'd up by a Membrane, the ſame that encloſes all the other Part; but does not form an exact Circle. The ſuperior of theſe Cartilages are the largeſt and broadeſt: The inferior are ſmaller and narrower, which by degrees are attenuated into very ſmall ones; for their whole Extent reaches not only to the *Jugulum*, but even into the Lungs: But when they come to the *Jugulum*, and enter into the very Subſtance of the Lungs, they form a compleat Circle, becauſe it was requiſite that the *Aſpera Arteria* ſhould be always expanded, for the Inſpiration and Expiration of the Air.

The *Thorax* has another Cartilage alſo, call'd the *Xiphoides*, or *Enſiformis*, which is annexed to the inferior Part of the Breaſt-Bone: Of which we have ſpoken already, when we gave you an Account of the *Sternum*.

In the *Inferior Venter*, or *Region*, there is no more than One Cartilage, which is very remarkable, in Children eſpecially, being coherent with the whole ſuperior Circle of the *Os Ilium*, call'd the Spine and the Appendage of the *Oſſa Innominata*; where divers Muſcles have their Originations; but in adult Perſons it degenerates into a Bone, as all the other Appendages do.

CHAP. IV.

Treats of the Ligaments, *their Nature, Uſe, and Differences.*

THE Bones and Cartilages ſerve for a Fence and *Baſis* to the Body; but ſince they requir'd alſo ſomething that might conjoin and keep them together, eſpecially thoſe Bones that are join'd togethet by a large but laxe Articulation, Nature has contriv'd certain *Ligaments*, by the Aſſiſtance of which they may with more Conveniency and Security perform their Functions, without being in conſtant Danger of Luxations.

A *Ligament* is a ſimilar Part of our Body, void of Senſation, of a medious Subſtance, betwixt a Cartilage and a Membrane, deſigned for the tying and keeping together the Joints of the Bones. We call it a *ſimilar Part*, becauſe every Part of it is like unto one another. Its Subſtance is *betwixt that of a Cartilage and a Membrane*, becauſe it is ſofter than the firſt, and harder than the latter; though ſometimes it comes nearer to the Nature of a Cartilage, ſometimes to that of a Membrane; from whence do ariſe Two Sorts of Ligaments, to wit, the *cartilaginous* and *membranous*. They are *deſigned*

for the tying together of the Joints of the Bones; which Words ſhew the principal *Uſe* of the *Ligaments*, which are ſo call'd *a Ligando:* For they do not only tie together thoſe Bones that are immoveable, as the *Oſſa Pubis*, but thoſe alſo that are articulated for Motion, as thoſe of the Joints. The only Difference there is betwixt theſe Two different Ways of tying them together, is, That the firſt is more compact, the other more laxe. This Laxity is contriv'd in ſuch a Manner, that they may perform theſe Motions notwithſtanding theſe Ligaments with Conveniency; but cannot ſlip out of their Place, unleſs by ſome violent and ſudden external Force. To perform their Function the better, they *were made void of Senſation*; for Man muſt have been ſubject to conſtant Pains, if by the Colliſion of the Bones the Ligaments had been ſenſible of Pain. They have alſo another Uſe, to wit, to keep ſome Parts in their proper Poſition: Theſe are either the *Viſcera*, as the *Liver* and the *Womb*; or the *Bones*, as does the Ligament of the Second *Vertebra*; or the *Muſcles* and their *Tendons*, as the annulary Ligaments in the Arms and Legs. Some alſo, like the Cartilages, ſerve for an Addition to the *Acetabula* of the Bones; ſuch is that Ligament which is plac'd at the *Sinus* of the *Scapula*, where it is articulated with the ſuperior Head of the *Humerus*.

The Ligaments differ from one another, *Firſt*, in Reſpect of their *Temperament* and *Subſtance*; for conſidering that ſome incline more to a cartilaginous, others to a membranous Nature; ſome are very hard, others very ſoft; and others again keep a *Medium* betwixt both: Whence it is, that (as we ſaid before) they are diſtinguiſh'd into *Cartilaginous* and *Membranous*. Thoſe that are like unto the Membranes are the *common Ligaments*, that incloſe the Joints; but to the Cartilages, which lie betwixt the Joints, and are either *round*, which ariſing from the Head of one Bone, are inſerted into the *Sinus* of another; or *broad*, ſuch are thoſe that tie the *Bodies* of the *Vertebræ* together.

In reference to the *Age* and *Sex*, they are much ſofter in Children than in aged People, and in Women than in Men.

As to their *Figure* and *Magnitude*, ſome are *round*, as the cartilaginous Ligaments that are betwixt the Bones, ſuch as is that by which the *Head* of the *Femur* is conjoin'd with the *Acetabulum* of the *Coxendix*; others are *broad*, ſuch as thoſe that incircle the Joints, call'd the *common Ligaments*. Thus thoſe that tie together the large Joints muſt of Neceſſity be the biggeſt, and thoſe of the leſſer Joints ſmaller: And this Difference in their Magnitude has a Relation not only to their Length, but alſo to their Breadth and Thickneſs; for where a greater Strength was required, by Reaſon of the ſtrong Motions of a Joint, or where the Articulation of the Bones was weak and ſlight, by Reaſon of a ſuperficial Cavity, they muſt of Neceſſity be thicker than otherwiſe.

There is alſo no ſmall Difference in Reſpect of their *Number*; for Nature has not conjoin'd one Ligament only with one Joint, but oftentimes more, where there was any Danger of a Luxation. Thus in the Joint of the *Femur* with the *Coxendix*, there is, beſides the common Ligament, which is broad, and ſurrounds the whole Joint, another round cartilaginous Ligament: And in the Articulation of the ſame *Femur* with the ſuperior Appendage of the *Tibia*, there are ſeveral Ligaments on the poſterior Part, becauſe that being the weakeſt, it requir'd it the more.

They differ alſo in their *Situation*, thus; ſome are *ſuperior*, ſome *inferior*, *anterior*, and *poſterior*, ſome on the *Right*, others on the *Left:* But their main Difference conſiſts in this, That ſome have their Poſition without the Joint, becauſe they inveſt it all about, as thoſe that are call'd the *broad Ligaments*; but others within the Joints, betwixt the Bones, as thoſe *round Ligaments* which tie together both the Joints of the *Femur*, to wit, the ſuperior with the *Acetabulum* of the *Coxendix*, and the inferior with the Two *Sinus's* of the *Tibia*; as likewiſe thoſe that are plac'd betwixt the *Bodies* of the *Vertebræ*, which are almoſt of a cartilaginous Nature.

They have their Riſe at, and are coherent to, the Bones that make the Joint, to wit, the Circumferences of the Heads and the Edges of the Cavities, where there are moſt commonly ſome *Foramina*, and ſome Inequalities on the Surface, for the Conveniency and Strengthening of their Origination, as well as their Inſertions.

CHAP.

CHAP. V.

Of the Ligaments of the Head, *of the* Thorax, *and the* Inferior Venter.

THE Ligaments of the *Head* are of Two Sorts, ſome belonging to the whole, the others to ſome Part only. Thoſe that have a Relation to the *whole Head*, are the Ligaments that belong to the Firſt and Second *Vertebra*, upon which the ſtreight, as well as the lateral Motions of the Head are performed, but to the *Parts* only which appertain to the *Inferior Maxilla*, the *Os Hyoides*, and to the *Tongue*.

The *Head* is articulated with the Firſt *Vertebra* by a membranous Ligament, that ſurrounds the whole Joint. This is ſo ſtrong, that this *Vertebra* will ſooner break than ſuffer a Luxation, which of Neceſſity muſt prove mortal.

But with the *Second Vertebra* it is conjoin'd by Two Ligaments: The Firſt is very ſtrong, round, and cartilaginous, ariſing from the very Point of the *Dens* of the Second *Vertebra* of the Neck, and is implanted into the *Os Occipitis*, near its Firſt great *Foramen*, through which the *Spinal Marrow* takes its Egreſs. The *Second* begins at one Side of the Firſt *Vertebra* of the Neck, and proceeds to the other, and incloſes the dentiform Proceſs of the Second *Vertebra* on its poſterior Part, and keeps it in its Poſition. Or elſe, the *Second Ligament* is that which cloſes up the *Sinus Quadratus* of the Firſt *Vertebra* on the poſterior Part, which was formed for the receiving of the *Dens*. It is very ſtrong, and of a cartilaginous Nature, to prevent the *Dens* from ſlipping out of its Place or *Sinus* in the violent Motions of the Head backwards; which muſt of Neceſſity prove fatal by reaſon of the Compreſſion of the Spinal Marrow by the ſaid *Dens*.

Beſides this, the *Firſt Vertebra* is conjoin'd with the Second by a ſlender membranous Ligament, which is the ſame both in reſpect of its Subſtance, and of the Manner of Connexion with the other *common* Ligaments.

The other *Vertebræ* are tied together by Two Ligaments. The *Firſt* is very ſtrong, and beſmear'd with an unctuous and mucous Humour, ſuch as is obſervable alſo in the other Joints. It is a *common* Ligament, and ſurrounds the *Vertebræ* on all Sides. And tho' it is very thick and ſtrong every where, yet it is thickeſt of all on the Sides towards the anterior Part, where the *Vertebræ* themſelves are ſomewhat thicker.

The *Second* Ligament is cartilaginous, and plac'd betwixt the *Bodies* of the *Vertebræ*, unto which it is alike both in its Breadth and Figure.

The Joint of the inferior *Maxilla* with the *Oſſa Temporum* is cover'd by a common Ligament.

The *Os Hyoides* has alſo Two ſtrong Ligaments, which are conjoin'd with its Sides: but beſides theſe, it has others, that are cartilaginous and round, and inſerted into both its Sides, by the Means of which it is conjoin'd together with the adjacent Parts, and kept as it were in an *Equilibrium*.

The *Tongue* is provided alſo with a very ſtrong membranous Ligament, which is plac'd under the middle Part of its Body, at the Extremity whereof grows a String, call'd the *Frænum of the Tongue*, which if it reaches as far as the Teeth, it hinders the free Motion of the Tongue in Children.

The *Vertebræ* of the *Thorax* and of the Loins are provided with the ſame Ligaments, as we have told you before concerning the reſt, excepting the Firſt and the Second *Vertebræ* of the Neck; and the other Joints of the *Thorax* are tied together by the common membranous Ligaments, ſuch I mean as incloſe the whole Joint. Such are thoſe that

join

join the Ribs with the *Vertebræ*; but they are pretty ſtrong and thick, eſpecially in the Firſt and Second Rib; and thoſe that conjoin the Ribs with the *Sternum* are likewiſe the ſame, only that they are not quite ſo ſtrong, and thinner.

In the *Inferior Venter* there are divers Ligaments: The *Firſt* is that ſtrong Ligament which ties the *Os Ilium* to the *Sacrum*. It embraces the whole Joint, being membranous on its exterior Part; but in that Part which is inſerted betwixt theſe Two Bones, it is hard and cartilaginous. This is that Ligament which is relaxated in hard Labours, as we have ſhewn before.

The *Second* Ligament it that which joins the *Os Sacrum* with that of the *Coxendix*, and is twofold; *one*, which is round and very ſtrong, having its Riſe at the *Os Sacrum*, where its Fifth Bone is united with the Sixth, and being inſerted into the exterior Protuberancy of the *Os Ilium*. The other ariſes in the ſame Place, and is implanted into the poſterior Appendage of the *Os Coxendicis*.

CHAP. VI.

Of the Ligaments of the Limbs; *and firſt, of thoſe of the* Hand.

THere are divers Ligaments belonging to that Part, which begins at the *Scapula*, and is call'd the *Hand*, to wit, thoſe that join the *Scapula* with the *Humerus*, next the *Humerus* with the *Radius*, the *Cubitus* with the *Radius*, and both theſe with the *Carpus*, and this again with the *Metacarpus*; and laſtly, thoſe that make the mutual Connexion betwixt the Bones of the Fingers.

Of thoſe Ligaments which tie the *Humerus* to the *Scapula*, there are Five: (1.) Is a common, broad, and membranous Ligament, which having its Riſe on the Edges of the *Cervix* of the *Scapula*, and ſurrounding the whole Joint, is inſerted in the internal and anterior Part of the *Head* of the *Humerus*. The *Second*, which is the ſtrongeſt of all, and plac'd on the ſuperior Part, ariſes from the external lateral Part of the Proceſs *Ancyroides*, runs obliquely, and is implanted into the Side of the *Acromium*, without as much as touching the *Humerus*. The *Third*, which is round, has its Origin at the exterior Part of the ſame Proceſs *Ancyroides*, and ends in the interior Part of the external Head of the *Humerus*. The *Fourth* begins in the ſuperior Part of the *Cervix* of the *Scapula*, which is next adjacent to the Proceſs *Ancyroides*, being acute, and taking its Progreſs over the internal *Head* of the *Humerus*, terminates in its exterior Head. The *Fifth* ariſes in the ſame Place with the *Fourth*, and ſtretching obliquely, is inſerted in the poſterior Part of the external *Head* of the *Humerus*.

All theſe Five Ligaments are commonly ſuppoſed to be formed to prevent the Luxations of the *Humerus*, which is articulated with the ſlight *Sinus* of the *Scapula*: But in my Opinion 'tis the Firſt alone that performs this Function. The Second, which does not as much as touch the *Humerus*, was deſign'd for the *Muſculus Superſcapularis Superior*, to keep it in its Place when it is contracted; for its Tendon is kept by this Ligament on its ſuperior Part in its Place, juſt as the annular Ligaments do the Muſcles that bend the Fingers. Of this you may be convinced by ocular Inſpection; for if you draw this Muſcle towards its Origin, you may ſoon be convin'd how ready it is to ſlip out of its Place, were it not for that ſtrong Ligament, which contains it within its Bounds. The other Three were deſign'd for the Inſertion of Three Muſcles; for the *Muſculus Infraſcapularis* is inſerted in the *Third* Ligament, the *Supraſcapularis Superior* in the *Fifth*, and the inferior *Scapularis* into the *Fourth*.

The

The *Radius* and the *Ulna* have alſo their Ligaments, by which they are conjoin'd with the *Humerus* and with the *Carpus*, as alſo with one another: With the *Humerus*, by the common membranous Ligaments; but with the *Carpus*, firſt alſo by one *common*, and afterwards by two others, one of which ties the *Ulna* and the other the *Radius* together with the *Carpus*. They are both round, the firſt having its Riſe in the Proceſs *Styloides* of the *Os Cubiti*, and ending in the Fourth Bone of the *Carpus*, and the other beginning at the Point of the *Radius*, and terminating in the *Carpus*. *Both theſe Bones* have a mutual Connexion by Means of a ſtrong membranous Ligament; which having its Riſe in the whole acute Line or Ridge of the *Ulna*, is inſerted into the whole oppoſite acute Line or Ridge of the *Radius*, and divides the internal Muſcles of the *Cubitus* from the external.

The Bones of the *Carpus*, of the *Metacarpus*, and of the Fingers, are provided with *common* Ligaments, which like Wings ſurround and tie them together. However the Bones of the *Metacarpus* have not only their Ligaments on the exterior Part, but on the Inſide alſo, where their Sides face one another, and are faſten'd together by Cartilages.

There are beſides theſe ſome other Ligaments obſervable in the Hand, for the Conveniency of the Tendons that take their Courſe to the Fingers, which are by them kept in their natural Poſition. They are call'd the *Annular*, and paſs tranſverſedly through the Hand. There are *Two* of them, *One* in the interior Part of the Hand for the Tendons of the *Muſculi Flexores*, and the *other* for thoſe of the *Extenſores*. But each of the Fingers alſo have their Ligaments of this Kind, ſeated in the external Part for the ſame End; which being placed lengthways at the Sides, are like ſo many Channels, in which the Tendons of the *Flexores Digitorum* are expanded.

CHAP. VII.

Of the Ligaments of the whole Leg.

THE Leg beginning at the Joint of the *Coxendix*, and ending at the Extremities of the Toes, muſt needs be provided with many Joints, that ſtand in need of Ligaments: (1.) The Joint of the *Femur* on the ſuperior Part with the *Coxendix*: (2.) Another of the ſame Bone on its inferior Part with the *Tibia* and *Fibula*: (3.) The Connexion of the *Tibia* with the *Fibula*: And, (4.) Of both theſe Bones one with the other: And laſtly, in the Feet, where the *Talus*, the *Tarſus*, the *Pedium*, and the *Toes*, require each their Ligaments.

The *ſuperior Head* of the *Femur* is tied to the *Acetabulum* of the *Coxendix* by Two Ligaments: (1.) By a *common* membranous and broad Ligament, which incircles the whole Connexion of theſe Bones, being the thickeſt and ſtrongeſt of all the Ligaments of the Body. The Second has its Poſition in the *Acetabulum*, betwixt the Joint, being cartilaginous and round. It ariſes out of the lowermoſt Part of the *Acetabulum*, where its Edge is not oſſeous, but conſiſts of Ligaments only, and has its Inſertion in the *Foramen* that is in the Middle of the *Head* of the *Femur*.

The *inferior Head* of the *Femur* is conjoin'd with the *Tibia* and *Fibula* by ſeveral Ligaments: The Firſt is a common and membranous Ligament, which incloſes the whole Joint, excepting that *Sinus* in the fore Part where the *Patella* is ſituated, where it is tied moſt ſtrongly together by the Tendons of Three Muſcles. The Second is very ſtrong and thick, plac'd in the *Ples*. It has its Riſe in the Middle of the poſterior Part of the *Tibia*; and aſcending ſtreight upwards, is divided into Two Branches, which are afterwards implanted into the Two inferior *Heads* of the *Femur*. The Third, which is anſwer-

anſwerable to the Second Ligament of the *Femur*, is very ſtrong and thick, and has its Origin in that great *Sinus* which is betwixt the Two inferior Heads of the *Femur*, (near the Place where the former is inſerted;) and ſtretching betwixt the Joint, is implanted betwixt the Two *Sinus's* of the ſuperior Appendage of the *Tibia*, where it has an unequal Prominency. The Fourth is ſlender, and has its Inſertion betwixt the Two inferior *Heads* of the *Femur*. It ariſes from the Middle of the beforeſaid *Second* Ligament, where it is ſeparated into Two Heads, and ſtretches upwards towards the *Femur*. The Fifth being round, covers the exterior Side of the Knee; and the Sixth on the contrary the interior Side.

The *Tibia* is conjoin'd with the *Fibula* on the ſuperior Part by a ſtrong Ligament, which incloſes theſe Bones on the exterior Part; but on that Side where they are diſtant from one another lengthways, with a membranous, broad, and ſlender Ligament; which ariſing from the *Tibia* with its oblique Fibres, ſtretches to, and is inſerted into the *Fibula*. It is altogether like that Ligament that conjoins the *Cubitus* to the *Radius*, and divides the anterior and poſterior Muſcles of the *Tibia*.

The *Tibia* and *Fibula* have their Connexion with the *Talus* by Three Ligaments. The Firſt is a common membranous Ligament, which ſurrounds the whole Joint: The other Two are cartilaginous; the Second having its Riſe at the Proceſs of the *Tibia*, which forms the interior *Malleolus*, and is inſerted into the internal Side of the *Talus*, which is receiv'd by the *Malleolus*; but the Third on the contrary has its Origin at the Appendage of the *Fibula*, which forms the external *Malleolus*, and is implanted into the exterior Side of the *Talus*.

The *Talus* is conjoin'd with the *Bones of the Foot* by many Ligaments. The Firſt is a *common* Ligament, which incircles the Joint of the *Calx* with the *Talus*. The Second is cartilaginous, having its Riſe at the inferior Part of the *Talus*, and its Inſertion into the *Calx*. The Third ſurrounds the whole Joint on the exterior Part. Its Riſe is in the Neck of the *Talus*, and its Inſertion in the *Os Naviculare*. The Fourth conjoins the *Os Calcis* with the *Os Cubiforme*; and being very ſtrong and cartilaginous, embraces the Joint. The Fifth having its Beginning at the *Cervix* of the *Talus*, is implanted into the *Os Cubiforme*.

The Ligaments of the *Tarſus*, of the *Pedium*, and of the Toes, are the ſame with thoſe that are in the Hand; as likewiſe thoſe that are in the *Pedium* are plac'd betwixt the Interſtices of the Bones, are cartilaginous, juſt as they are in the *Metacarpus*; the reſt being membranous.

Beſides theſe, there are here alſo obſervable the ſame annular Ligaments as in the Hand, theſe containing the Tendons that take their Progreſs to the Feet. The Firſt of theſe is *tranſverſe* in the anterior Part of the Foot, and conjoins the *Tibia* with the *Fibula*. The Second having its Riſe at the interior *Malleolus*, is inſerted into the *Os Calcis*. This forms Three Rings, though at firſt Sight it ſeems to be ſingle. The Third ariſes from the external *Malleolus*, and is implanted into the ſame *Os Calcis*. And laſtly, in the inferior Part of the Toes there are the ſame Ligaments as in the Fingers, through which paſs the Tendons that bend the Internodes of the Toes.

Monſieur *Dion*'s Demonſtration of the Bones was not thought fit to be brought in here, becauſe it is very well tranſlated into *Engliſh* before, and agrees in all the Material Points with Monſieur *St. Hilaire*.

A ſhort Account of the TEETH. *Taken out of Monſieur* Charriere's Anatomie nouvelle de la Tête de l'Homme.

THE Teeth are the moſt ſolid, the moſt ſmooth and even, the moſt maſſy Bones, conſidering their Smallneſs. They are call'd *Dentes, quaſi Edentes, i. e. Eaters*, becauſe they ſerve for the chewing our Meats. They make their Firſt Appearance in the Seventh or Eighth Month after the Child is born.

Moſt commonly there are Sixteen of them in each Jaw-bone, to wit, Four *Inciſores*, Two *Canini*, and Nine or Ten *Molares*.

The *Inciſores* are flattiſh and ſharp-edged, a little convex on the Outſide, and concave on the Inſide. The *Canini* are round, and pointed at the End; bnt the *Molares* are large and unequal at their Extremities. Theſe laſt and the *Canini* were deſign'd for the breaking and grinding of our Aliments, and the *Inciſores* to ſeparate and cut them in Pieces. The *Inciſores* and *Canini* have only One Root, but the *Molares* are furniſhed with Two or Three, and ſometimes with Four.

Our Jaws are provided with a good Number of Teeth of different Figures, which were deſigned not only for the Maſtication and Trituration of the Aliments, and for Ornament's Sake, but alſo for the better Articulation of the Words and Syllables.

But that you may be made ſenſible in what Manner the Teeth, by the various Motions of the Muſcles, do contribute towards the Determination of the Sound or the Voice, it muſt be conſider'd, that the Parts of which the Mouth doth conſiſt are diſpos'd and fram'd in ſuch a Manner, that when the Sounds are incircled within its Compaſs, they receive different Determinations, according to the different Way of the Opening of the Mouth.

As for Inſtance: When you open your Mouth but a little, ſo as to make your Lower Teeth to advance towards the Upper Teeth, this will form a Sound or Voice which terminates in *E*. If you make your Teeth to approach ſtill nearer to one another, yet ſo as not to touch one another, this will determine the Sound or Voice which terminates in *I*. Laſtly, if you bring your Teeth very near to one another, yet ſo as not abſolutely to cloſe them, and at the ſame time draw your Two Lips outwards without joining them cloſe together, you will then form a Voice or Sound which terminates in *U*. Theſe are Three Vowels, or rather Three different Sounds or Voices, which cannot be eaſily made without the Aſſiſtance of the Teeth.

In the next Place, it is very well worth our Pains to enter upon an Enquiry, in what Manner theſe Checks are modified in the Voice, which produce theſe different Articulations that are expreſs'd in Writing by certain Characters call'd Conſonants, and how at the ſame time the Teeth are ſubſervient towards the Modifications of the Air upon theſe Occaſions.

There are ſome among theſe which owe their Articulation only to the Lips; ſuch are the Conſonants, *P*, *M*, *B*, which are are made by conjoining the Two Lips, and the Sound *A*, and opening them again; which makes us pronounce in an articulated Sound the Syllables *Ba*, *Ma*, *&c.* with this Difference nevertheleſs, That when we pro-

nounce the Conſonant *M*, we open the Mouth in the ſame Manner as when we are to utter the Vowel *E*.

But there are a great many in which the Teeth do facilitate the Pronunciation: As for Inſtance; the Letter *F* is pronounced when we conjoin our Lips from outwards upon the Upper-Teeth; ſo that the Air is compreſs'd in ſuch a Manner, as that it cannot open its Paſſage outwards without making a whiſtling Noiſe; ſo that when you diſcloſe your Lips, it forms the Voice *A*, and articulates the Syllable *Fa*: The laſt of which is call'd a *Vowel*, becauſe it expreſſes the Determination of the Sound, *i. e.* the Voice; and the firſt, which diſtinguiſhes the Manner by which this Voice is articulated, and ſounds at the ſame Time with the other, is call'd thence a *Conſonant*.

What has been ſaid in reference of the Letter *F* with the Vowel *A*, may be applied to the ſame Conſonant with other Voices or Vowels, without any Difference in their Articulation, which is the ſame, becauſe it always begins by diſcloſing our Lips; and it does not receive its different Determinations from any Thing elſe, but from the different Poſition the Parts of the Mouth are confined to when they form theſe different Voices or Sounds. 'Tis further obſervable, That in this laſt Articulation, the Lips do not join ſo exactly together, as in the preceding.

The *V* Conſonant is pronounced like the Letter *F*, with this Difference only, That in the Letter *F* we preſs the Lip cloſer to the Teeth than in the *V* Conſonant.

In the Pronunciation of the Two Letters *S* and *Z*, we bring the Under-Teeth pretty cloſe to the Upper-Teeth; which is the Reaſon why the Air cannot make its Paſſage out of the Mouth, without making a whiſtling Noiſe.

In the Pronunciation of the Letter *D*, the Teeth of the Upper-Jaw are ſtruck upward's by the End of the Tongue. In the Formation of the Letter *N*, they are touch'd upon or ſtruck near the Palate: And when we pronounce the Letter *T*, both the Upper and Under-Teeth are ſtruck againſt at the Place where they conjoin together. 'Tis in this Manner that the Teeth ſtrengthen the Voice or Sound, and their different Articulations, and that the Air is compreſs'd, reflected, interrupted, and exagitated, a Thouſand different Ways by the ſeveral Motions of the Parts of the Mouth.

And upon this Occaſion we might not improperly enter upon an Examination of the different Motions of the Tongue, which contribute to the Formation and Articulation of the Voice; but that I did judge it more ſuitable to our preſent Purpoſe, to defer this Enquiry to that Part of this Treatiſe where we ſhall have Occaſion to ſpeak of the Organ of the Taſte.

Though the Teeth are progenerated from the Seed, as well as all the other Bones are, nevertheleſs their Encreaſe or Growth is perform'd in a different Manner.

The *Alveolus* or Socket in a *Fœtus* is provided with a Membrane ſhaped like a ſmall Bladder, interſpers'd with an infinite Number of Veſſels, which making a Kind of Net-work, might upon that Account not improperly be call'd *Chorion*. Some Time after the Birth of the Child, from this ſmall Bladder is expanded a Kind of gelatinous Glue, which does form a Layer, that is indurated by little and little. Now, whether this Matter iſſues from this ſmall membranous Bag, or from the Arteries, or from ſome Gland, is uncertain; but thus much is true beyond all Diſpute, that this is the true *Germen*, or Seed, out of which the Teeth are formed.

Upon this Firſt Layer ſome freſh Matter is gather'd, which does form a Second, and a Third, till ſuch Time that the Body of the Tooth is brought to its full Growth. The Firſt Layers are always the cloſeſt and moſt ſolid, becauſe they are preſs'd together by the others.

They muſt be conſider'd like ſo many Eminencies or ſmall Hillocks, which have their Valleys ſeated betwixt them, and are call'd the Cavities of the Teeth: For which Reaſon it is, that the Teeth may be divided into *Laminæ*, like the Horns; and they are nouriſhed alſo after the ſame Manner; for the ſmall Veſſels which pierce through their Roots, do puſh forward the nutritious Juice to their Extremities, in the ſame Manner as it does for the Nouriſhment of the Skin, to wit, the leaſt Drop of the nutritious Juice, whenever it enters

enters or is puſh'd forward into the ſmalleſt Pore, does of Neceſſity force from thence forward that which lies next before it. 'Tis in this Manner alſo that the Plants do receive their Nouriſhment from the Particles of the Earth, which do enter into the Poroſities of their Roots.

Some Authors will not allow of any ſuch Thing as the Regeneration of the Teeth. They alledge, That thoſe new Teeth that come forth inſtead of thoſe that are fallen out, are generated at firſt with the others, and that the Teeth being thus double in Number, they do not receive a ſufficient Supply of Nouriſhment; and conſequently thoſe that appear firſt, muſt of Neceſſity make Way for the laſt. But Experience teaches us, That if a Tooth be drawn before the Perſon comes to a certain Age, there ſucceeds a new one inſtead of it; and if they do not grow again in ſome particular Bodies, the Reaſon is, becauſe their Roots are ſo big, eſpecially in the *Molares*, that towards the Concluſion of the Term of their Encreaſe, they diſtend the *Alveolus* to ſuch a degree, as to deſtroy the *Germen*, and their Form; but the Reaſon why they do not grow again in adult Perſons is, becauſe their Parts begin to be exſiccated and drawn together.

In the Motion of the inferior Jaw, Nature makes Uſe of a moſt ingenious Mechanical Contrivance, to wit, the *Apophyſis Coronoides*, unto which the *Muſculus Crotaphites* is faſten'd, is elongated, with a Deſign to lengthen the Strength or Force of of the fixed Point, which is the Place where the inferior *Maxilla* is articulated with the ſuperior, which ſerves inſtead of a Supporter to it.

For it is demonſtrable, That the farther the Strength is removed from the Center of the Support, the greater is its Force; ſo that if you endeavour to lift up a heavy Burthen with the Teeth, the nearer you approach to the fixed Point, the eaſier it is to be taken up: But if you propoſe (for Example) to lift it up with your Teeth in the Middle, you will find your Strength to fail, becauſe from the fixed Point to the Burthen, and from the Burthen to the Strength, the Diſtances are alike.

Sometimes we feel a Kind of Irritation in the Teeth, eſpecially when we eat ſome Fruits that are as yet unripe. Theſe Acids do fix in ſome meaſure thoſe Juices that nouriſh the Gums: Whence it is, that their Veſſels begin to be tumified, and the Membranes become more tenſe, and conſequently more ſenſible. Theſe Juices by their Acidity do prick the ſmall Fibres of the Membrane which inveſts the *Alveolus*, and cauſe a violent Pain. They are expanded over the Surface of the Tooth, and rub off its ſmall Particles, which makes it rough and uneven.

There is alſo another Sort of Irritation belonging to the Teeth, which is occaſion'd by the Noiſe or Sound of ſome ſharp-edged Thing: As for Inſtance: If you ſcrape a Piece of Braſs or Tin with a Knife or a File, and that by ſuch interrupted Motions as make a grating Noiſe in the Air, which being at the ſame Moment communicated to the Teeth, they begin to be grated and grinded together, not without ſome Senſe of Pain. This grating Noiſe in the Air is communicated to the Membranes of the Gums, by that tremulous Motion which is made in the Membrane of the *Tympanum* or Drum of the Ear. This Communication of the Membrane of the *Tympanum* with the Membrane that does inveſt the Tooth, proceeds not only from the Vicinity of the Bone which it covers, but alſo from the Nerves which they receive, which belong to the ſame Pair.

We are ſenſible of the ſame Affection and Pain when we chaw ſome Sand, or elſe tear a Hat with the Teeth. In theſe Caſes, the Teeth muſt of Neceſſity be looſen'd by theſe ſmall and ſudden Shocks, which are occaſion'd here by the Bodies that have a Kind of a Spring, a Thing not obſervable in thoſe Things that are either ſoft or very hard; for the ſoft Ones give way to the Gums, and the hard Bodies do preſs or ſqueeze it too violently together; but having no Spring or Reſort, they are not qualified to cauſe that ſame Senſe we are ſpeaking of here.

Among all the Bones, there are none that are ſo much ſubject to the *Caries* as the Teeth are: The Reaſon is, becauſe, beſides that Humour which iſſues from the Glands of

the Gums, and the Nutritious Juice which is convey'd to them by the Arteries, they are also moisten'd by the *Saliva*, or Spittle. 'Tis easie to be conceiv'd, That if there is any vitious Leaven or Ferment in the Blood, it is more apt to be sublimated, or raised upwards, than to be precipitated or cast downwards; Nature being much inclined, and meeting with more Facility, to discharge it through these Emunctories. But the most frequent Cause of the *Caries* of the Teeth is to be attributed to the slow and difficult Circulation of their nutritious Juice; for the Vessels do not pierce any deeper than their Roots, and only furnish the nutritious Juice by Drops, and that in no greater a Quantity than what is absolutely necessary for their Nourishment. Hence it is, that the Remainders of that nutritious Matter which is convey'd to their Extremity, being not reconvey'd into the Blood, by way of Circulation, without a great deal of Difficuly, is qualified, in case it meets with some impure Bodies or Particles, to introduce an Alteration in their Substance, to destroy their Texture, and make them ulcerate.

'Tis to this Cause that is owing that Kind of *Caries* where the Vessels are laid open, but especially the Nerve, which occasions a most exquisite Pain by the least Impression that is made upon it by the Air.

All the other *Species* of the *Caries* which are observable in the Teeth, are occasion'd either by Defluctions, or by certain Alterations in the *Saliva*. 'Tis not for my present Purpose to enter upon a particular Description of the Remedies that are prescribed in the *Caries* by the Physicians: I will only mention one at this Time, to wit, the *Opium*, which by its narcotique Quality not only quickly appeases the violent Pains of the Teeth, but also checks the Progress of the Fluxions. You may apply it to the affected Tooth, as also to the Artery of the Temples, in form of an Emplaister.

The Symptoms that very commonly make their Appearance when the Teeth begin first of all to cut the Gums, and come forth out of the *Alveoli*, in young Children, are, a very acute Pain, Convulsions, Coughs, a Difficulty of Swallowing, an Aversion to Food, Vomiting, Looseness, a Fever, and Heaviness.

All these Symtoms, as they are occasion'd by nothing else but by the Pain, which owes its Cause to a Solution of the Continuity of the small Fibres, the Union of which makes the First Constitution of the Parts; it must be observed here, That the *Periosteum* and the Skin of the Lips do form the Gums, and invest the whole Palate. So that when the Teeth begin to force their Passage through the *Periosteum* and the Skin, they occasion abundance of Divulsions, which do determine the Blood and the Spirits to flow in an irregular and confused Manner into the Muscles of the Jaws, and consequently do produce Pains and Convulsions.

The Muscles make a Compression by their convulsive Motions upon the Glands, and thus force the *Saliva* to disembogue it self in a great Quantity into the Cavity of the Mouth, where, by irritating the Fibres of the *Larynx* and of the *Pharynx*, it causes a Cough, and Difficulty of Swallowing.

When this *Saliva* is carried or runs down along the *Oesophagus* into the Stomach, and irritates or stimulates its Fibres, it causes an Aversion to Food. If by its long Continuance there it turns sharp and acrious, it makes such strong Impressions upon the Fibres of this Part, as to irritate it to Vomitings.

The Stomach does by its violent Contractions press upon the *Bileuris* and *Pancreatick* Ducts; so that the Bile and Pancreatick Juice being squeezed out in a greater Quantity than ordinary into the Cavity of the Intestines, occasions a Looseness.

In case some of the vicious impure Particles of this Ferment are convey'd through the *Lacteal* Veins to the Heart, and the Blood is carried with a very rapid Motion to the Head, by the violent Fermentation which is occasion'd there, it produces a Fever and Heaviness.

To appease the Pain, which is the Spring from whence all the other Symptoms have their Rise, you may rub the Gums with Hares-Blood and the Decoction of the Roots of *Scorzonera*, and other such-like Remedies.

Joseph

Joſeph Lanzon, *M. D. his Anatomical Diſſertation of the* TEETH: *Preſented to* Johannes Jacobus Mangetus, *One of the Editors of the* Bibliotheca Anatomica.

THE *Dentes*, or Teeth, are ſo call'd, *quaſi Edentes*, *i. e.* Eaters. They are ſmall Bones of their own Kind, hard, white, and ſmooth, inarticulated with the *Alveoli* of the *Maxillæ* by a *Gomphoſis*, deſign'd firſt for the Comminution and Grinding of our Food, and next for the better Pronunciation. I have call'd them Bones of their own Kind, becauſe they are deſtitute of the *Periоſteum*; of which, more at the Concluſion of this Diſſertation.

They are of a very hard Subſtance; and becauſe they are daily worn away by Manducation, they encreaſe alſo again every Day: And if a Tooth happens to fall out, and does not grow again, the oppoſite Tooth grows to ſuch a Length, till it has fill'd up the vacant Space. *Fallopius* ſays, That the *Viſformatrix* remains in the Teeth till to a very advanced Age. The Teeth are generated in the Womb out of the Seed; for I have obſerved, and ſhewn to my Auditors, ſome imperfect Teeth in the *Alveoli* of Infants before they were Nine Months old.

In Brutes they appear ſooner than in Men, where they ſhew themſelves about the Seventh or Eighth Month after the Birth. The Firſt that make their Appearance are the *Inciſores*, being leſſer and ſharper-edged than the reſt; and the laſt are the *Molares*. Children are commonly afflicted with Fevers during the Time of Dentition, and with Looſeneſs: Which ariſes from the Pain they ſuffer whilſt they are perforating the Gums. About the Seventh Year we change our Teeth; but this Change does not happen to all at all Times, but moſt commonly to the *Inciſores* and *Canini* only, and thoſe of the *Molares* that are next to the *Canini*. I remember a Woman of 21 Years of Age who had not changed her Teeth; and a Boy of Nine Years, who had changed all the *Inciſores*, the *Canini*, and the *Molares*. They are plac'd in the Circumference of the Upper and Lower *Maxillæ*: And the *Dentes Sapientiæ* do not appear till about the 21ſt, 26th, or the 30th Year of Age. In Men the Teeth are of Three Sorts, *viz.* the *Inciſores*, or Cutters; the *Canini*, or Dog-Teeth; and the *Molares*, or Grinders. The Firſt are the foremoſt Teeth, being ſo call'd from their chewing or cutting the Meats. The Second are ſo nam'd from their Hardneſs and Sharpneſs: They are call'd alſo the Eye-Teeth; and there are no more than Two of them in each *Maxilla*. The laſt are the largeſt, and ſomewhat obtuſe; having obtained their Name from their grinding of the Food. Of theſe there are more than of the Firſt Sort.

As to the Number of the Teeth, it is not always the ſame in all Men; but moſt commonly it amounts to Fifteen or Sixteen in each *Maxilla*. What *Plutarch* relates of *Pyrrhus*, That he had one continued Bone, diſtinguiſh'd only by ſmall Lines inſtead of Teeth, is an extraordinary Thing. *Pliny*, *Diemerbroeck*, and *Tho. Bartholin*, have given us Inſtances of the ſame Nature. I have my ſelf obſerved a double Set of Teeth in a young Man of our City of *Ferrara*.

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L. 4. *c.* 12. And *Bartholin* in his *Anatomia Reformata* ſays, That *Lewis* XIII. King of *France*, had a triple Row of Teeth.

The Superficies of the Teeth is ſmooth and equal, their Colour white, unleſs they be chang'd by Age, Sickneſs, or Neglect. I obſerv'd in a Jew of about 33 Years of Age, that his Upper Dog-Teeth were of a green Colour. Each Tooth receives an Artery from the *Carotides*, a Vein from the *Jugulars*, and Nerves from a Branch of the Fourth Pair: Whence it is, and becauſe the Roots of the Teeth are inveſted with a very ſubtil *Perioſteum*, that they have a very exquiſite Senſe. *P. Dionyſ.* in *Anatom. Demonſt.* affirms, That there is a very ſmall Cavity in the Teeth, into which there falls ſometimes a Defluxion of an acrious Seroſity, which corroding the Tooth, produces ſuch an inſupportable Pain, that the Patient is ready to run mad, and is not deliver'd of the Pain without having the affected Tooth drawn. Thoſe who talk of Worms in the Teeth are very much miſtaken. The Teeth have a three-fold Uſe: The Firſt is the Maſtication of the Aliments; the Second the Articulation of the Voice: Whence it is, that ſuch as are deſtitute of Teeth, do not pronounce without much Difficulty certain Letters, to wit, *C, D, S, T, X, Z.* The Third is for Ornament's Sake; for a Set of well fram'd, well diſpos'd, and white Teeth, is a great additional Ornament to a Face.

Thus much concerning the Teeth in general. Let us now proceed to give a ſhort Account concerning certain Queſtions ſtarted by ſome about the Teeth.

The Firſt is concerning their Senſation: For ſome are of Opinion, That the Teeth have a Senſe only in Reſpect of their Membranes; but others pretend to maintain, both by Authorities and Experience, That they are ſenſible even in their Subſtance. Their Authorities they found upon thoſe of *Hippocrates*, *Ariſtotle*, and *Galen*, and their Experience upon the Two Extremities of Heat and Cold; for if either of them touch the Teeth, they are extreamly ſenſible of it. Others are of Opinion, That they are not ſenſible of rough, hard, or ſoft Things, becauſe they will bear the File, and will break without Pain: But there is a great Difference betwixt Senſible in a general Senſe, and Feeling of a Pain. The Teeth are ſenſible of Aſperities, hard or ſoft Things, without Pain; but ſuch violent Things as are the Extremities of Heat and Cold, do not only penetrate to that Part where their Membranes are, but alſo affect their Subſtance with Pain.

Another Queſtion is, Whether the Firſt Teeth are real Teeth, and whether thoſe that ſucceed the Teeth that are fallen out, are quite new Teeth, or only Branches ariſing from the old Roots? *Diemerbroeck* (in *Anatom. l. 9. c.* 10.) is of Opinion, That though the Teeth about the Seventh Year of Age fall out, they leave their Roots behind them; and that therefore the Firſt, as well as the Second Teeth that ſucceed them, are true and actual Teeth, and that they have their Riſe out of the ſame Roots; juſt as we ſee it in the Plants, and in the Horns of the Stag; for we cut off the Plants, but another ſprouts forth out of the ſame Root. The Stag caſts his Horns, but new ones grow on the ſame Root. Thoſe that are curious to know more of this Argument, I will refer to *Columbus*, *Rolfincius*, *Euſtachius*, *Riolan*, *&c.*

The Third Queſtion is, Whether the Teeth are Parts of the Body? I ſay with *Hippocrates*, *Galen*, and *Ariſtotle*, That they are; for they are Bones, and therefore muſt be Parts of our Body. We know the true Definition of a Part to be, to wit, a Subſtance or Body coherent to the whole, whoſe Subſtance depends on the whole, and deſign'd for ſome Function: All which being applicable to the Teeth, they are doubtleſs Parts of our Body.

The Fourth Queſtion is, What is the Nature of the Matter out of which the Teeth are formed? I am of Opinion, That the Teeth are generated out of the Seed, *mediate*; but *immediate*, out of that Matter which is prepar'd in the *Maxillæ*; for theſe produce a certain thickiſh, unctuous and viſcous, nutritious Matter, out of that Part of which, that remains after the *Maxillæ* have been ſufficiently nouriſhed, the Teeth are produced. Our *Piccolomini* calls it a ſpermatick Aliment.

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The Fifth Queſtion is, What makes them fall out, and to be ſucceeded by other Teeth, about the Seventh Year of Age? Unto this I anſwer, That the *Maxillæ* being nouriſhed at firſt by thin, ſoft, and lacteous Ailments, the Firſt Teeth are conſequently thin, and of a ſoft Subſtance; but after the Seventh Year, when we begin to feed upon more ſolid and hard Meats, it is requiſite, that, inſtead of the ſoft Extremies of the Firſt Teeth, there ſhould be produced others, which might be adapted to the hard Subſtance of thoſe Aliments, and conſequently prove more uſeful to us.

The Sixth Queſtion is, What it is that makes the Teeth encreaſe and grow continually, when it is evident that all the other Bones have their Magnitude determin'd? The continual Encreaſe of the Teeth ſeems to be neceſſary and always uſeful to thoſe Things for which they were made and deſign'd, to wit, that they might be always in a Condition to cut and break aſunder the Meat; and as by their continual Action, they are worn out at their Extremities, it was fit this Loſs ſhould be repaired by a continual Encreaſe. Perhaps this Encreaſe of the Teeth may be attributed alſo to the Nature of the Nouriſhment prepar'd in the *Maxillæ*, which being conſtantly ſupplied to the Teeth, they grow on; whereas the nutritious Matter of the Bones remains unactive after they are come to their due Growth.

The Seventh Queſtion is, What Difference there is between the Teeth and the other Bones? I ſay, the Teeth differ from the other Bones in Three different Qualifications: Firſt, in being endued with Senſation, as we have ſhewn before. Secondly, in their Hardneſs and Solidity, for they are harder than any of the other Bones. And Thirdly and Laſtly in this, That the Teeth do continually encreaſe, and grow; whereas the other Bones do always keep within the Limits and Rules preſcribed to them by Nature.

The Eighth Queſtion is, What Difference there is between the Teeth themſelves, and how many of them? I anſwer, there are no leſs than Six Differences: The Firſt depends on their Number; for ſome have only Two continued Bones, one in the ſuperior, and the other in the inferior *Maxilla*; as *Plutarch* has obſerved of *Pyrrhus*, a King of the *Epirotes*: Whereas ſome others have 26, others 28, and others 32, nay, ſometimes 34. The Second Difference relates to the Rows of the Teeth: The Third to their Poſition and Production: The Fourth is taken by Way of Similitude: Thus ſuch Teeth as are like to the Teeth of a Comb, are call'd *Dentes Serrati*: Of which, ſee *Pliny*. The Fifth ariſes from the Difference in the Age: Thus we have the *Dentes Ignorantiæ* in Children, and the *Dentes Sapientiæ* in adult Perſons. The Sixth and the Main Difference relates to their Roots; for ſome have but one ſingle Root, as the *Canini*; others have two, others three, and ſome others four, as the *Molares*.

Some have ſtarted alſo a Ninth Queſtion, concerning the Uſes of the Teeth, beſides the Three before-mention'd, to wit, for Maſtication, for the better Articulation of the Voice, and for Ornament's Sake; and have added Two more: The Firſt they have taken from *Homer*, who ſeems to intimate, That the Teeth are a Fence againſt Garrulity, to keep the Tongue within Bounds: And the Second is, That the Teeth were made alſo for the better Defence of Men; but this laſt Uſe ſeems to appertain much more properly to ſome Brutes, ſuch as Dogs, Wolves, *&c.*

Dated from my Study at Ferrara, *the 3d of* June, *Anno* 1697.

A ſhort Recapitulation of the Doctrine of the BONES in Humane Bodies. Taken out of *James Keill*, M. D. his Anatomy of the Humane Body Abridg'd.

SECT. I.

Of the Bones, Cartilages *and* Ligaments, *in General.*

THE Bones are made of hard Fibres, faſten'd to one another by ſmall tranſverſe Fibres, in the ſame Manner as thoſe of the Muſcles are. Theſe Fibres being ſoft and porous in a *Fœtus*, are eaſily diſcern'd. They are probably nouriſh'd by the Lymphatick Part of the Blood, convey'd to them by the Arteries, and carried back by the Veins. Their Pores being fill'd by the Lympha, they encreaſe, harden, and grow cloſe to one another; and when their Pores are full of this Subſtance, (which is of their own Nature) the Bones are grown to their full Extent, Hardneſs, and Solidity. Their Blood-Veſſels being compreſs'd on all Sides by their oſſeous Ducts, convey no more Blood than what is requiſite for the ſupplying of the Places of their decaying Particles.

All the Bones that are of any conſiderable Thickneſs have either a large Cavity, or elſe ſmall Cells: Either of theſe contain a certain oleaginous Subſtance or Marrow, in proper Veſſels, like the Fat. In the larger Bones, this fine Oil, by the Heat of the Body, is evaporated through the ſmall Pores of its Veſicles, and entring ſome narrow Paſſages leading to ſome fine Ducts, excavated in the Subſtance of the Bones lengthways, and from theſe other croſs Paſſages, not exactly oppoſite to one another, (leſt they ſhould weaken the Bone too much in one Place) convey the Marrow ſtill further into more longitudinal Channels, plac'd nearer the Surface of the Bone, to the end that the Marrow may ſupple the Fibres of the Bones, and render them leſs ſubject to Fractures.

All the Bones except the Teeth, and where the Bones are join'd together by Articulations, are cover'd with a thin, ſtrong, and very ſenſible Membrane, call'd the *Periоſteum*; which ſeems to intimate, that it is an Expanſion of ſome of the tendinous Fibres of the Muſcles. Its Uſe is to ſupport the Veſſels which convey the Nouriſhment into the Subſtance of the Bones.

Each of the larger Bones is bigger at its Extremities than in the Middle, for the better Articulations of the Joints. But becauſe the Middle of the Bone required a ſufficient Strength, both to ſupport the Weight of the Body and to reſiſt any outward Violences, the Fibres here are very cloſe and compact, and the Bone is hollow within, and conſequently not ſo eaſily fractur'd: For of Two Bones of equal Length and equal Number of Fibres, the Proportion of their Strength will be according to their Diameters.

On the exterior Surface of the Bones there are ſeveral Cavities and Prominencies. The Cavi-

Cavities are either narrow and ſhallow, or wide and deep. The Firſt Sort is call'd *Glene*, and the Second *Cotyle*. The Protuberancies are diſtinguiſh'd into *Apophyſes* and *Epiphyſes*: The Firſt is a Protuberancy made by the Fibres of the Bone; and the *Epiphyſis* a Prominency made by a ſmall Bone plac'd upon the Extremity of a larger Bone, which, as we advance in Age, are united in One. Both the one and the other are commonly upon the Extremities of the Bones, being deſign'd for the Inſertions of Muſcles, or elſe for the Articulation of the Bones, their whole Difference conſiſting in their Figure: For if the Protuberancy be large and round, it is call'd the *Head*, and the Part next adjoining under it the *Neck*; but if it be ſmall and round, it is call'd a *Condylus*. If it be a pointed Prominency, then it is call'd *Corone*, *Styloides*, *Coracoides*, *&c.* from its Reſemblance to ſome certain Thing.

The Bones contain abundance of very ſubtil and penetrating volatile Salt and Spirit, ſome fœtid Sulphur, a little Phlegm, and much Earth.

A Cartilage is a ſmooth and ſolid Body, ſofter than a Bone, but harder than a Ligament. It is without either Cavities or Cells, or Marrow, and deſtitute of any Membrane. The Cartilages have a natural Spring, by which, if they are forc'd from their natural Figure or Poſition, they will return to it of themſelves as ſoon as the Force ceaſes. Their Situation is chiefly in thoſe Places where a ſmall and eaſie Motion is requir'd, as in the Ears, Noſe, *Larynx*, *Arteria Aſpera*, and *Sternum*; and their natural Elaſticity ſerves inſtead of Antagoniſt Muſcles. They alſo inveſt the Extremities of the Bones, where they are join'd together for Motion, being not only ſmoother than the Bones, and without Senſation, but alſo much ſofter; by which the Attrition which is made by the Motion of the Joint is the more eaſily ſupplied.

A Ligament is a white and ſolid Body, ſofter than a Cartilage, and harder than a Membrane, being without any conſpicuous Cavities or Senſation. Their chief Uſe is to tie the Bones together, that are articulated for Motion, to prevent their Diſlocations.

Without inſiſting here upon the various Sorts of Articulations of the Bones, and their Denominations, which have been ſufficiently explained before in ſeveral other Treatiſes, it will be ſufficient to ſay in this Place, That the Ends of all the Bones that are join'd to one another with a manifeſt Motion, are tied together by membranous Ligaments, which riſe from the Conjunction of the *Epiphyſis* with the Bone; and paſſing over the Articulation, are inſerted at the ſame Place in the other Bone. Thus they form a Kind of a Bag, which encompaſſes all that Part of the Extremities of the Bones which act upon one another; and this Bag contains a Mucilage, which is ſubſervient to the eaſier Motion of the Joint, and is ſeparated by certain Glands, that lie in ſome Fat on the Inſide of the Ligaments. Such Bones as have their Articulations by *Ginglymus* have much ſtronger Ligaments on their Sides than on their anterior or poſterior Part, that the Protuberancies may be kept ſteady in their Cavities in their Motions; without which, they would be ſubject to frequent Diſlocations.

SECT. II.

Of the Bones of the Skull.

THE *Cranium*, or Skull, is a Compoſition of ſeveral Pieces, which being join'd together, make a conſiderable Concavity, which contains the Brain.

The Bigneſs of the Skull is proportionate to the Bigneſs of the Brain, being of a round Figure, but ſomewhat flat at the Sides: Its Roundneſs being the moſt capacious for the containing of the Brain, and its Flatneſs contributing to enlarge the Sight and Hearing.

Each Bone of the *Cranium* is compoſed of Two *Laminæ*, or Tables, between which there is a ſpongeous Subſtance, made of ſome bony Fibres proceeding from each *Lamina*, call'd in *Greek Diploe*, and by the *Latins Meditullium*. This contains a great Number of Arteries and Veins, for the Nouriſhment of the Bones. The Two *Laminæ* are hard and ſolid, their Fibres being very cloſe to one another; but the *Meditullium* is ſoft, and its Fibres at a greater Diſtance: All which not only makes the Skull much lighter, but alſo leſs ſubject to Fractures.

The exterior Table of the *Cranium* is ſmooth, and inveſted with the *Pericranium*. The interior is ſmooth alſo, but has ſeveral Furrows, made by the Pulſe of the Arteries of the *Dura Mater*, whilſt the *Cranium* was yet ſoft and yielding.

The Bones belonging properly to the *Cranium* are join'd to one another by Four Sutures. The *Coronalis* reaches tranſverſly from one Temple to the other, joining the *Os Frontis* with the *Oſſa Parietalia*. The *Lambdoidalis* unites the *Os Occipitis* to the *Oſſa Parietalia* and *Petroſa*. The *Sagittalis*, which begins at the Top of the *Lambdoidalis*, extends it ſelf ſtreight to the Middle of the *Coronalis*, and joins the Two *Oſſa Parietalia* together. The Fourth of theſe Sutures is call'd the *Squamoſa*, from its having its Parts join'd and lapp'd ſlopewiſe one over another: Whence it has been call'd a ſpurious Suture, but erroneouſly, it having its Indentations; by which the ſemicircular Circumference of the *Oſſa Temporum* is join'd to the *Os Sphænoides*, *Occipitis*, and to the *Oſſa Parietalia*.

Beſides theſe Four Sutures by which the Bones of the Skull are join'd to one another, they have alſo their Connexions with the Bones of the Under-Jaw by Three other Sutures, *viz.* the *Tranſverſalis*, which running acroſs the Face, paſſes from the leſſer Corner of the Eye to the Bottom of the Orbit, and then up again by the great Angle of the Eye over the Root of the Noſe and thence to the leſſer Angle of the other Eye, and joins the *Os Frontis* to the Bones of the Upper-Jaw. The *Ethmoidalis* encloſes the Bone that bears the ſame Name, and joins it to the circumjacent Bones. The Suture *Sphænoidalis* encompaſſes the Bone of that Name, and joins it to the *Os Occipitis*, the *Oſſa Petroſa*, and to the *Os Frontis*.

The various Sutures which join together the Bones of the *Cranium*, were neceſſary to render it the leſs ſubject to Fractures, to give Paſſage to ſeveral Membranes and Veſſels which ſuſpend the *Dura Mater*, and go to the *Pericranium*, as alſo to further Tranſpirations through theſe Junctures.

The Skull is compoſed of Six Bones that are proper, and Two that are common to it and the Upper-Jaw. The Six proper are: (1.) The *Os Frontis*, which makes the fore Part of the *Cranium*: (2.) The *Os Occipitis*, which makes its hinder Part: (3.) and (4.) The *Oſſa Parietalia*: And (5.) and (6.) The *Oſſa Temporum*, which make the Sides. The Two common are, the *Sphænoides* and *Ethmoides*, which are Part of the *Baſis* of the *Cranium*.

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The *Os Frontis* or *Coronale* is almoſt round, and joins the Bones of the *Sinciput* and Temples by the Coronal Suture, and the Bones of the Upper-Jaw by the *Sutura Tranſverſalis*, and the *Os Sphænoides* by the *Sutura Sphænoidalis*. It makes the ſuperior Part of the *Orbita*, and has Four *Apophyſes*, which are at the Four Angles of the Two Orbits. Above the Orbits it has Two Perforations, which give Paſſage to a Vein or Artery, and to ſome Twigs of the Firſt Branch of the Fifth Pair of Nerves. It has alſo one in each Orbit, a little above the *Os Planum*, through which paſſes a Twig of the Ophthalmick Branch of the Fifth Pair to the Noſe.

Above the Eyebrows it has Two *Sinus's* between its Two *Laminæ*, being lin'd with a thin Membrane, in which there are ſeveral Blood-Veſſels and Glands, which ſeparate a Mucoſity that diſtils into the Noſtrils. On the Inſide of this Bone are ſeveral Aſperities made by the Veſſels of the *Dura Mater*, and it has Two large *Sinus's* made by the anterior Lobes of the Brain. It has alſo a ſmall blind Hole above the *Criſta Galli*, in which the Extremity of the *Sinus Longitudinalis* is inſerted; and from this Hole a pretty large Spine runs up along its Middle: But ſometimes inſtead of this Spine there is a *Sinus*, in which is lodged the *Sinus Longitudinalis*. This Bone exceeds the Bones of the *Sinciput* in Thickneſs; but is thinner than the *Os Occipitis*. In Children it is always ſeparated in its Middle by a Suture.

The *Os Occipitis* is plac'd in the hinder Part of the Head, being ſhap'd not unlike a Lozenge, with its lower Angle turn'd inwards. It unites the *Oſſa Parietalia* and *Petroſa* by the *Sutura Lambdoidalis*, and the *Os Sphænoides* by the *Sphænoidalis*. It exceeds in Thickneſs all the Bones of the Skull, yet it is very thin where the *Splenius*, *Complexus* and *Trapezius* are inſerted. It is rough on its Outſide, and on the Inſide it has Two *Sinus's*, in which lie the Two Protuberancies of the *Cerebellum*; as alſo Two Furrows, in which are lodged the *Sinus Laterales*. It has no leſs than Seven Holes: The Firſt Two are common to it and the *Oſſa Petroſa*: The lateral *Sinus's* and the *Parvagum* go through them. The Third is the great Perforation, through which paſſes the Spinal Marrow. The Fourth and Fifth are the Holes through which the Ninth Pair of Nerves paſſes. The Sixth and Seventh are Two Holes that give Paſſage to the Veins, which bring the Blood from the external Integuments to the *Sinus Laterales*. Sometimes there is but One, and ſometimes none of theſe Two; and ſometimes there are Two more, through which the vertebral Veins paſs. This Bone has Two *Apophyſes*, One on each Side of the *great Hole*, being lin'd with a Cartilage, and articulated with the Firſt *Vertebra* of the Neck. From a Protuberancy it has in its Middle, there riſes a ſmall Ligament, which is inſerted into the Firſt *Vertebra* of the Neck. It is longer in Beaſts than in Men.

The Third and Fourth are the Bones of the *Sinciput*, call'd the *Parietalia*, being the thinneſt of the whole Skull: They are ſomewhat ſquare, oblong, and join'd to the *Os Frontis* by the *Sutura Coronalis*, and by the *Sutura Sagittalis* to one another in the Crown of the Head; by the *Lambdoidales* to the *Os Occipitis*, and by the *Sutura Squamoſa* to the *Oſſa Temporum*. On their exterior Part they are ſmooth and equal, but in their interior Part they have divers Furrows, made by the Pulſe of the Arteries of the *Dura Mater*. Near the *Sutura Sagittalis* they have each of them a ſmall Hole, which give Paſſage to ſome Veins that convey the Blood from the *Teguments* to the *Sinus Longitudinalis*.

The Fifth and Sixth are the *Oſſa Temporum*, ſeated on the lower Part of the Sides of the Skull. Their upper Part, which is thin, conſiſting only of One *Lamina*, is of a circular Figure, and join'd to the *Oſſa Parietalia* by the *Sutura Squamoſæ*; but their lower Part being hard, thick, and unequal, is join'd to the *Os Occipitis*, and to the *Os Sphænoides*. This Part is call'd the *Os Petroſum*. They have each of them Three external Proceſſes, and One internal. The Firſt among the external is the *Proceſſus Zygomaticus*, which running forward, and being united with the *Os Mali*, makes that Bridge call'd the *Zygoma*, under which lies the Tendon of the *Crotaphite* Muſcle. The Second is the *Mamillaris*, or *Maſtoidæus*, being ſhort and thick, and plac'd behind the *Meatus Auditorius*. The Third is the *Styliformis*, being long and ſmall. To it are faſten'd the *Cornua* of the *Os Hyoides*. The internal Proceſs,

which is pretty large, and long in the *Baſis* of the *Cranium*, contains all the Cavities and ſmall Bones of the Ear. Theſe Bones have Two internal, and Four external Holes. The Firſt of the internal is that which gives Paſſage to the Auditory Nerve, and the Second it has common with the *Os Occipitis*, through which paſſes the Eighth Pair of Nerves and the lateral *Sinus's*. Among the external Holes, the *Meatus Externus Auditorius* has the Firſt Place. The Second is behind the Palate, being the End of that Paſſage which comes from the Barrel of the Ear to the Mouth. The Third is the Orifice of the Conduit, by which the *Carotidale* Arteries enter the Skull. And the Fourth is behind the *Proceſſus Maſtoidæus*. By it paſſes a Vein, which conveys the Blood from the external Teguments to the lateral *Sinus's*. This Hole is ſometimes wanting. There is another betwixt the *Proceſſus Maſtoidæus* and the *Styliformis*, through which the *Portio Dura* of the auditory Nerve paſſes. They have each a *Sinus*, inveſted with a Cartilage, under the *Meatus Auditorius*, which receives the *Condylus* of the Lower Jaw.

Of the Two Bones common to the *Cranium* and Upper-Jaw, the Firſt is call'd *Sphænoides*, being of a very irregular Figure, and plac'd in the Middle of the *Baſis* of the *Cranium*. By the *Sutura Sphænoidalis* it is join'd to all the Bones of the Skull, except in the Middle of its Sides, where it is continued to the *Oſſa Petroſa*, as they were one Bone. On its exterior Part it has Five Proceſſes: The Firſt Two are broad and long, not unlike a Bat's Wing, and have each a pretty long *Sinus*, from whence the Muſcles *Pterigoidæi* have their Riſe. They have each alſo at their lower End a ſmall Hook like a Proceſs, upon which the *Periſtaphilinus Externus* turns its Tendon. The Third and Fourth form the interior and inferior Part of the *Orbita*; and the Fifth is a ſmall Proceſs like the *Criſta Galli* in its anterior Part, which is receiv'd in a Cavity at the further Extremity of the *Vomer*. In the Middle of this Bone is alſo a ſmall Prominency, from which the Muſcles of the *Uvula* take their Riſe. On its interior Part it has Four *Apophyſes*, call'd *Clinoides*, which form a Cavity in the Middle of this Bone, call'd the *Sella Turcica*, in which lies the *Glandula Pituitaria*. Betwixt the Two *Lamina* of this Bone, under the *Sella Turcica*, there is a *Sinus*, divided in Two in its Middle, which opens by Two Holes into the Cavity of the Noſtrils. The *Os Sphænoides* has no leſs than Twelve Holes. By the Firſt and Second paſs the *Optick* Nerves. By the Third and Fourth (call'd the *Foramina Lacera*) paſs the Third and Fourth Pair, the Firſt Branch of the Fifth Pair, and the Sixth Pair. By the Fifth and Sixth paſſes the Second Branch of the Fifth Pair. By the Seventh and Eighth paſſes the Third Branch of the ſame Pair. By the Ninth and Tenth enter the Arteries of the *Dura Mater*. And by the Eleventh and Twelfth enter the internal *Carotidales*, and the intercoſtal Nerve goes out. The Canals through which the *Carotidales* enter are oblique. The Beginning of them is in the *Oſſa Petroſa*; and they open within the *Cranium* in the *Sphænoides*.

The Second of the common Bones is the *Os Ethmoides*, ſeated in the Middle of the *Baſis* of the *Os Frontis*, and join'd by the *Sutura Lambdoidalis* to that Bone, and to the *Os Sphænoides*. It has a ſmall Proceſs in its Middle, call'd the *Criſta Galli*, to which is faſten'd the fore End of the *Falx*. This Bone has many ſmall Perforations, through which paſs the Fibres of the Olfactory Nerve; whence it is call'd the *Os Cribriforme*. From its inferior Part there goes a thin Bone, which divides the Cavity of the Noſtrils in Two; and the inferior Edge of this Bone is grov'd with the *Vomer*. On each Side of this Partition are ſeveral thin *Laminæ*, call'd the *Oſſa Spongioſa*, being full of little Cells, where they are join'd to the *Ethmoides*. There are alſo Two *Laminæ*, which have no Coherency either with the other *Laminæ*, or with the *Os Ethmoides*, but only by the Membrane that covers them all. The Two exterior *Laminæ* of the *Oſſa Spongioſa* make Part of the *Orbita* at the greater Angle; and from their Smoothneſs are call'd *Oſſa Plana*.

SECT

SECT III.

Of the Bones of the Upper-Jaw.

BEſides theſe Two beforeſaid Bones, that are common both to the Skull and to the Upper-Jaw, there are Eleven proper Bones belonging to it, *viz.* Five on each Side, and One in the Middle, being join'd to the Bones of the *Cranium* by the Three common Sutures, and to one another by a fine but true Suture.

The Firſt among the proper Bones is the *Os Mali*, or *Zygoma*, being of a triangular Figure; the ſuperior Side whereof makes the inferior and exterior Part of the Circumference of the *Orbita*, where it joins the *Os Sphænoides*, and its interior Side joins the *Os Maxillare*. Its external has a long *Apophyſis*, which joining that of the *Oſſa Temporum*, forms the *Proceſſus Zygomaticus*. It joins the *Os Frontis* at the leſſer Angle of the Eye. It is concave within, and it ſticks out a little forwards, making the higheſt Part of the Cheek.

The Second, call'd the *Os Maximum*, or *Maxillare*, becauſe it contains all the Teeth of the Upper-Jaw, is of a very irregular Figure; on its Outſide joins the *Os Mali*, and on its upper Side makes the inferior and interior Part or Circumference of the *Orbita*, and at its great Angle it joins the *Os Unguis* and *Frontis*. The interior Side of the *Os Naſi* is join'd to it. Under the Upper-Lip it is united with its Partner; and both together make the anterior and greateſt Part of the Roof of the Mouth. It is very thin; and between its Two *Laminæ* is a ſpacious Cavity, which opens by a ſmall Perforation into the Noſtrils. In its inferior Part it has Sixteen *Alveoli*, or Sockets, in which the Teeth are fix'd. It has alſo a ſmall Hole, call'd the *Orbiter Externus*, in that Part of it which makes Part of the *Orbita*, through which paſs the Nerves of the Fifth Pair which come from the Teeth; and behind the Teeth call'd the *Inciſores*, where it is join'd with its *Fellow*, it has another, that comes from the Noſtrils.

The Third among the Bones of the Upper-Jaw is the *Os Unguis*, being a ſmall thin Bone plac'd in the great Angle of the *Orbita*. It has a Hole, in which the lacrymal Sack lies. This Bone being lodged entirely in the great Angle of the *Orbita*, it ought rather to be reckon'd a *Lamina* of the *Os Spongioſum*, (as the *Os Planum*) than One of the Bones of the Upper-Jaw.

The Fourth, call'd the *Os Naſi*, is a thin but ſolid Bone, making the upper Part of the Noſe. Its ſuperior Extremity is join'd to the *Os Frontis* by the *Sutura Tranſverſalis*. On One of its Sides it is united with its Partner, (where they are ſuſtain'd by the *Septum Narium*,) and with its other Side it joins the *Os Maxillare*. At its inferior Extremity are faſten'd the Cartilages of the Noſtrils. It is ſmooth on the Outſide, but rough on its Inſide.

The Fifth Bone, call'd the *Os Palati*, is a ſmall and almoſt ſquare Bone, making the hinder Part of the Roof of the Mouth, and being join'd to that Part of the *Os Maxillare* which makes the fore Part of the Palate. It is alſo join'd to its *Fellow*, and to the *Proceſſus Pterigoidæus*. This Bone has One ſmall Hole, through which a Branch of the Fifth Pair of Nerves paſſes to the Membrane of the Palate.

The Eleventh and Laſt among the Bones of the Upper-Jaw is the *Vomer*, being plac'd in the Middle of the lower Part of the Noſe. In its upper Side it has a Cleft, in which is receiv'd the lower Edge of the *Septum Naſi*; and in its further End it receives a ſmall Proceſs of the *Os Sphænoides*; and on its inferior Part it is join'd to the *Os Palati*.

From what has been related it is evident, That the *Orbita* of the Eye is compos'd of the Bones of the *Cranium* and of the Upper-Jaw;

Jaw: For the ſuperior Part of it is form'd by the *Os Frontis*; the interior and inferior Part of the great Angle is made by the *Os Unguis* and the *Os Planum*; and the interior and inferior Part of the leſſer Angle by the *Os Sphænoides*. The *Os Maxillare* makes the inner and lower Part of the Circumference, and the *Os Mali* the exterior and lower Part.

For the better Underſtanding of the Structure of the Head, it will not be amiſs to enter upon a brief Recapitulation of the Holes belonging to the Head. Theſe are External or Internal: The External are:

(1.) The Two in the *Os Coronale*, above the *Orbita*, through which paſs a Vein, Artery, and a Nerve from the Ophthalmick Branch of the Fifth Pair for the Brow and Frontal Muſcles. This frequently appears only as a Notch. (2.) The *Orbiter Internus*, in the ſame Bone, within the *Orbita*, a little above the *Os Planum*, for another Branch of the Fifth Pair of Nerves which goes to the Noſe. (3.) That between the *Os Unguis* and the *Os Maxillare*, in the greater Angle, through whrch the *Ductus Lacrymalis* paſſes to the Noſe. (4.) The *Orbiter Externus*, in the *Os Maxillare*, below the *Orbita*, through which the Nerves and Veſſels that come from the Teeth take their Paſſage to the Cheek. (5.) A ſingle Hole in the ſame Bone, behind the fore Teeth, which comes from the Noſe. (6.) Two in the *Oſſa Palati*, through which a Branch of the Fifth Pair of Nerves paſſes to the Palate, *Uvula*, and Gums. (7.) In the Temporal Bone, between the *Proceſſus Maſtoidæus* and *Styliformis*, through which goes the *Portio Dura* of the Auditory Nerve. (8.) The external Auditory *Ductus*. (9.) The internal Auditory *Ductus*. (10.) The Conduit for the *Carotidal* Artery. (11.) In the ſame Bone, through which paſſes a Vein from the external Teguments to the lateral *Sinus's*. This is behind the *Proceſſus Maſtoidæus*. (12.) In the *Os Occipitis*, behind its Proceſſes, through which the Vertebral Veins paſs. (13.) In the ſame Bone, for a Branch of the *External Jugular*. (14.) One ſingle large Hole for the *Spinal Marrow*.

The Internal Holes are: (1.) The blind Hole above the *Criſta Galli*. (2.) The Holes in the *Os Ethmoides*. (3.) In the *Os Sphenoides*, for the Optick Nerves. (4.) The *Foramen Lacerum*, through which the Third, Fourth, and the Firſt Branch of the Fifth and Sixth Pair of Nerves paſs. (5.) For the Second Branch of the Fifth Pair of Nerves. (6.) For the Third Branch of the ſame Nerve. (7.) The *Foramen Arteriæ Duræ Matris*. (8.) The Canal through which the *Carotidal* enters, and the *Intercoſtal* paſſes out; (but this has been number'd among the external Holes.) (9.) In the Proceſs of the *Os Temporum*, through which paſſes the Auditory Nerve. (10.) That between the Temporal and Occipital Bones. It is divided in Two by the *Dura Mater*: Through the One Part paſſes the Eighth Pair of Nerves, and the *Nervus Acceſſorius*; through the other, the *Lateral Sinus's* open into the internal Jugulars. (11.) One in each Side of the large Hole of the *Occiput*, through which goes out the Ninth Pair of Nerves.

SECT. IV.

Of the Lower Jaw-Bone.

THE Lower Jaw conſiſts of One Bone, whoſe Fibres at the Chin do not turn oſſeous in Children till they are about Two Years old. It is compos'd of Two *Lamina*, which are ſmooth, but pretty hard, and the Interſtice betwixt theſe Two Tables is porous, and full of ſmall Cavities. Its Figure is not unlike the Letter U. It has Two *Apophyſes* at each End: The ſuperior is call'd *Corone*, being thin, but broad at its Beginning, and ending in a ſharp Point, which paſſing under the *Proceſſus Zygomaticus*, gives Inſer-

Inſertion to the Tendon of the Crotaphite Muſcle: The other, which is ſhorter and lower, has its round Head inveſted with a Cartilage, which is articulated into the *Sinus* of the *Os Petroſum*; but betwixt the Cartilage that covers the *Sinus*, and that which is over the Head of this *Apophyſis*, there is a Third, which is coherent to the *Annular* Ligament, that encompaſſes this Articulation. The Motion of the Jaw ſideways, which is requiſite for Chewing, is facilitated by the Intervention of this looſe Cartilage. The inferior Edge of this Jaw is call'd its *Baſis*, each End of which is call'd the Angle of the Lower-Jaw.

This Lower-Jaw has Four Holes, Two on its Inſide near its *Apophyſes*, and Two on the Outſide near its Middle. By the internal Holes enter a Branch of the Fifth Pair of Nerves, an Artery from the *Carotidales*, and a Vein paſſes out to the Jugulars: Their Branches are ſpread in the Roots of the Teeth. By the external Holes theſe ſame Veſſels paſs, which are diſtributed upon the Chin. It has alſo Sixteen *Alveoli*, which are the Receptacles of the Teeth.

SECT. V.

Of the Teeth.

THE Teeth are remarkable both for their Uſefulneſs and their extraordinary Solidity, they being the ſmootheſt and hardeſt Bones of the Body, form'd in the *Alveoli* of the Jaws, that are inveſted with a thin Membrane, upon which there are ſeveral Veſſels, through which there paſſes a thick, viſcid and tranſparent Humour, which by degrees encreaſes, and hardens in the Form of Teeth. Theſe about the Seventh or Eighth Month after the Birth of the Child begin to pierce the Edge of the Jaw, and by tearing the Gums and the *Perioſteum*, create that Violence of Pain, which often is attended with moſt dangerous Symptoms in Children during their Time of Toothing.

'Tis for this Reaſon that Nature produces not all the Teeth at one Time; for firſt the *Dentes Inciſivi* of the Upper-Jaw make their Appearance, and then thoſe of the Lower-Jaw, they being both the thinneſt and ſharpeſt. Next to theſe appear the *Canini*, or *Dog-Teeth*, which are ſharper than the *Molares*, or *Grinders*, but thicker than the *Inciſives*: And laſt of all the *Grinders*, being both the thickeſt and bluntеſt.

Of this before-mention'd viſcous Humour there are Two Lays, the one below, the other divided by that Membrane which covers all the Cavity of the Jaw. The Firſt Teeth owe their Origin to the uppermoſt Lay; but theſe are thruſt out about the Seventh Year of Age by the Teeth form'd of the undermoſt Lay; and theſe Teeth when loſt never grow again: But if ſome have been obſerv'd to ſhed their Teeth twice, they have had Three Lays of this viſcous Humour. The Two laſt of the *Grinders*, which come out about the One and twentieth Year, are call'd *Dentes Sapientiæ*.

We told you before, That the Teeth, of which there are ſometimes 14, ſometimes 15, and ſometimes 16, in each Jaw, are of Three Sorts, *viz.* the *Dentes Inciſivi*, *Canini*, and *Molares*. The *Inciſivi* are call'd the Four foremoſt Teeth in each Jaw, being pretty broad, but ſharp at their Ends; a little convex on the Outſide, and hollowiſh on the Inſide. They have each a longiſh and a little crooked Root, which grows ſmall towards its Extremity, that the Preſſure might not be all directly upon one Point of the Jaw, but ſuſtained equally by every Part which the Sides of the Root touch.

Of the *Canini*, or Dog-Teeth, there are Two in each Jaw, *viz.* One on each Side of the *Inciſivi*. They are pretty thick and round, but terminate in a ſharp Point. They have each One Root, which is longer than thoſe of the *Inciſivi*. Their proper Uſe

is

is to pierce the harder Meats, becauſe the fore Teeth are apt to ſtart outwards by thoſe Things; and therefore Two Third Parts of them are fix'd within the Sockets, by which their Reſiſtance of all lateral Preſſures is the greater.

Of the *Dentes Molares*, or Grinders, there are moſt commonly Ten in each Jaw, theſe being the biggeſt and thickeſt of the Teeth, and their Extremities broad and uneven: And becauſe the Preſſure upon them is perpendicular, they have ſometimes Two, ſometimes Three, and ſometimes Four Roots, ſeparated a little from one another: So that having a broad *Baſis*, they meet with the greater Reſiſtance from the Jaw when they chew the Aliments: And their Roots are bent a little outward, to break the Force of the Preſſure upon the Gums. The laſt among the *Grinding-Teeth* are alſo bigger and harder than all the reſt, and nigheſt the Articulation, becauſe their Uſe, which is to grind the hardeſt Meats ſmall, requires the greateſt Strength. The Roots of the Upper-Teeth are alſo larger than thoſe of the Under-Jaw, becauſe the Upper-Jaw is not ſo ſtrong to reſiſt the Force of the Teeth as the Lower is.

SECT. VI.

Of the Spine *and the* Vertebræ.

THat Chain of Bones which begins at the Firſt *Vertebra* of the Neck, and reaches down to the *Os Coccygis*, is call'd the *Spine*. Of the *Vertebræ* there are Twenty four, (beſides thoſe of the *Os Sacrum*) *viz.* Seven of the Neck, Twelve of the Back, and Five of the Loins. They are not plac'd in a ſtreight Line, but thoſe of the Neck bend inwards, and thoſe of the Back outwards, for the enlarging the Concavity of the *Thorax*: Thoſe of the Loins incline inwards again, and thoſe of the *Os Sacrum* outwards, to enlarge the Cavity of the *Pelvis*.

Each *Vertebra* is diſtinguiſh'd into the Body of the *Vertebra* and its Proceſſes; the Firſt being ſofter and more ſpongious than the latter, which are harder and more ſolid. The anterior Part of the Body is round and convex, and the poſterior ſomewhat hollow; but its ſuperior and inferior Sides are plain, and each of them inveſted with a Cartilage, which is pretty thick forwards, but thin backwards. Theſe Cartilages yielding to the Preſſures of the Bodies of the *Vertebræ*, make them come cloſer together, and helps us to bend our Body forwards. Each *Vertebra* has Three Sorts of Proceſſes towards its poſterior Part; Two tranſverſe or lateral, One on each Side: They are nearer the Body of the *Vertebræ* than the reſt. In each of them there is a Tendon of the vertebral Muſcles inſerted. Four oblique Proceſſes, *viz.* Two on the ſuperior Part, and Two on the inferior, by which the *Vertebræ* are articulated to one another: And One acute, on the hindermoſt Part of the *Vertebra*.

Theſe Proceſſes, with the poſterior or concave Part of the Body of the *Vertebra*, form a ſpacious Cavity in each *Vertebra*; and all theſe Cavities or Holes anſwering one another, compoſe that Channel through which deſcends the *Medulla Spinalis*, which ſends out its nervous Branches by Pairs into the ſeveral Parts of the Body through Two ſmall Perforations, made by the Joining of Four Notches in the Sides of each ſuperior and inferior *Vertebra*.

The *Vertebræ* are join'd to one another by a *Ginglymus*; for the Two deſcending oblique Proceſſes of each ſuperior *Vertebra* of the Neck and Back have a little Dimple in their Extremities, wherein they receive the Extremities of the Two aſcending oblique Proceſſes of the inferior *Vertebra*; ſo that the Two aſcending Proceſſes of each *Vertebra* of the Neck and Back are received, and the Two deſcending do receive, except the Firſt of the Neck, and the laſt of the Back:

the aſcending Proceſſes of each *Vertebra* of the Loins receive, and the Two deſcending are receiv'd, contrary to thoſe of the Neck and Back.

The *Vertebræ* are all faſten'd together by a hard Membrane, conſiſting of large and ſtrong Fibres. It inveſts the Body of all the *Vertebræ* forwards, from the Firſt of the Neck to the *Os Sacrum*. That Channel which is made by the Concavity of each *Vertebra*, is alſo lin'd with a Membrane, that ties them all together: Beſides which, the Bodies of each *Vertebra* are faſten'd to one another by the Intervention of Cartilages, and the Tendons of the Muſcles, which being inſerted in their Proceſſes, tie them together behind.

The Structure of the Spine was abſolutely neceſſary for the Performance of its Functions; for had it been of One Bone, it would have been without Motion; had it been made of Two or Three Bones, the Spinal Marrow would have ſuffer'd a Compreſſion at every Joint: Nor would they have render'd the Back ſufficiently pliable for the ſeveral Motions we have Occaſion to make here. And if it had been without the intervening Cartilages, it would have had no more Uſe than if it had been but One Bone. And if each *Vertebra* had had a diſtinct Cartilage, it would have been ſubject to Diſlocations: Beſides that, the oblique Proceſſes of each ſuperior and inferior *Vertebra*, keep that which is betwixt them, that it can neither be thruſt forwards nor backwards to bruiſe the Spinal Marrow.

Seven *Vertebræ* belong to the Neck, which differ from the reſt; (1.) In that they are ſmaller and harder: (2.) In that their tranſverſe Proceſſes have Perforations, for the Paſſage of the vertebral Veſſels: And, (3.) That their acute Proceſſes are bifid and ſtreight. Beſides this, the Firſt and Second *Vertebræ* have ſomething peculiar to themſelves.

The Firſt, which is call'd the *Atlas*, being faſten'd to the Head, moves with it upon the Second ſemicircularly. Its aſcending oblique Proceſſes receive the Tubercles of the *Occiput*, upon which Arciculation the Head is only mov'd forwards and backwards; and its deſcending Proceſſes receive the aſcending Proceſſes of the Second *Vertebra*. It has no acute Proceſs, which would have impaired the Action of the *Muſculi Recti*; but a ſmall Prominency, to which the ſmall Ligament of the Head is inſerted. In the anterior Part of its great Hole it has a pretty large *Sinus*, in which is lodg'd the Tooth-like Proceſs of the Second *Vertebra*, being tied by a Ligament, that riſes from each Side of the *Sinus*, to prevent its hurting the Spinal Marrow. In its ſuperior Part it has Two ſmall *Sinus's*, in which lie the Tenth Pair of Nerves, and the Vertebral Arteries.

The Second is call'd the *Vertebra Dentata*, becauſe in the Middle, between its Two oblique Proceſſes, it has a long and round Proceſs like a Tooth, which is receiv'd into the aforeſaid *Sinus*. Upon it the Head, with the Firſt *Vertebra*, turns half round, as upon an *Axis*. The End of this Proceſs is tied to the *Occiput* by a ſmall but ſtrong Ligament. The Diſlocation of this Tooth-like Proceſs is mortal, becauſe it quite compreſſes the Spinal Marrow.

The Third *Vertebra* is call'd *Axis*; and the Four following have no Name, nor any particular Difference.

The Twelve *Vertebræ* of the Back are larger than thoſe of the Neck, but ſmaller than thoſe of the Loins. Their acute Proceſſes ſlope downwards upon one another. In each Side of their Bodies they have a ſmall Dimple, wherein they receive the round Ends of the Ribs; and another in their tranſverſe Proceſſes, which receives the little Protuberancy near the Extremity of the Ribs. The Twelfth *Vertebra* of the Back is articulated with the Firſt of the Loins by *Arthrodia*; for both its aſcending and deſcending oblique Proceſſes are receiv'd.

The Five *Vertebræ* of the Loins are the broadeſt of all; and the laſt of them is larger than any other among all the *Vertebræ*. Their acute Proceſſes are broader, ſhorter, and more diſtant from one another, and their tranſverſe longer, to ſuſtain the Bowels and Muſcles of the Back. They have no Perforations, nor any *Sinus's*; and their Cartilages betwixt their Bodies exceed all the others in Thickneſs.

The *Vertebræ* of the *Os Sacrum* make but One large and ſolid Bone in adult Perſons,

of the Figure of an *Iſoſecles* Triangle, whoſe *Baſis* is faſten'd to the laſt *Vertebra* of the Loins, and the ſuperior Part of its Sides to the *Ilia*, and its Point to the *Os Coccygis*. It is concave and ſmooth on its anterior Part, but convex and unequal on its poſterior. It hath Five Holes on each Side; but the Nerves paſs only through the Five on its Foreſide. Its acute Proceſſes are ſhorter and leſs than thoſe of the Loins; and the inferior is always ſhorter than the ſuperior.

The *Os Coccygis* is join'd to the Extremity of the *Os Sacrum*, and conſiſts of Three or Four Bones, the lower being ſtill leſs than the upper, till the laſt terminates in a ſmall Cartilage. Its Uſe is to ſuſtain the ſtreight Gut. It gives way to the Preſſure of the *Fœtus* in Women in Travail; and if Midwives thruſt it backwards with too much Violence, it produces ſometimes very bad Effects.

If we conſider how the Motion of the *Vertebræ* is performed, we ſee that the Head moves only backwards and forwards upon the Firſt *Vertebra* of the Neck, and ſemicircularly upon the Second. The ſmall Tubercle of the Bone of the hind Head falling upon another in the Firſt *Vertebra*, ſtops the Motion of the Head backwards, that it may not impair the *Medulla Spinalis*, and the *Sternum* prevents its moving too far forwards. Its ſemicircular Motions are limited by the Ligament which faſtens the Proceſs of the Second *Vertebra* to the Head, as alſo by thoſe that join the Firſt to the Second *Vertebra*. The Motion of the ſucceeding *Vertebræ* of the Neck, though it be not ſo manifeſt, yet is greater than that of the *Vertebræ* of the Back; for their acute Proceſſes are ſhort and ſtreight, and the Cartilages between their Bodies thicker: And on the other Hand, the Cartilages of the Twelve *Vertebræ* of the Back being thin, their acute Proceſſes long, and near to one another, and fix'd alſo to the Ribs, they have the leaſt Motion of all; the greateſt Motion of the Back being owing to the *Vertebræ* of the Loins, whoſe Cartilages are thicker, and their acute Proceſſes wider from one another; becauſe the thicker the Cartilages are, the better we bend our Bodies forwards, and the greater Diſtance there is betwixt the acute Proceſſes, the more we may bend the Body backwards. In ſome People the *Vertebræ* are diſtorted ſeveral Ways. In thoſe that have the *Vertebræ* of the Back ſtick out, the intermediate Cartilages betwixt the *Vertebræ* are very thin and hard forwards, but thick backwards, where the oblique Proceſſes of the ſuperior and inferior *Vertebræ* are at a good Diſtance from one another, which Diſtance fills up with a viſcous Matter. And this Difference of the Thickneſs of the Cartilages is owing either to a Relaxation, or Weakneſs of the Ligaments and Muſcles which are faſten'd to the Backſide of the *Vertebræ*; in which Caſe, their Antagoniſts finding no Oppoſition, remain in a continual Contraction, and conſequently there is no Motion in theſe *Vertebræ*. This Deformity ſometimes has its Origin in the Womb, when the Bones being ſoft and tender, the Bodies of the *Vertebræ* partake of the ſame Inequalities as the Cartilages. If the Bunch be on one Side, *viz.* to the Right, the Cartilages on the ſame Side are very thick, but thin and dry on the other Side. On the Left Side the oblique Proceſſes are cloſe together, but at a good Diſtance on the Right; and the Ligaments and Muſcles are much extended on the Right Side, as thoſe on the Left are much contracted. If the *Vertebræ* are diſtorted inwards, all Things have a different Face. The Cartilages, and ſometimes the *Vertebræ* alſo, are very thick forwards, but exceeding thin and hard backwards. The acute and oblique Proceſſes come cloſe to one another; and the Ligaments on the Bodies of the *Vertebræ* are much relax'd; but the Muſcles and Ligaments that join the Proceſſes together are quite contracted. If theſe Diſtortions happen in the *Vertebræ* of the Loins, the miſerable Patient has little or no Motion in his Back.

SECT.

SECT. VII.

Of the Ossa Innominata.

OF the Bones call'd the *Ossa Innominata* there are Two, and these very large Ones, plac'd on the Sides of the *Os Sacrum*. In a *Fœtus* they may each be separated into Three Parts, which in adult Persons make but One Bone. The First and Uppermost of these Three Bones is call'd the *Os Ilium*, the Intestine *Ilium* lying betwixt it and its Fellow. It is very large, not unlike a Crescent, somewhat convex and unequal on its Outside, which is call'd its *Dorsum*, and hollowish and smooth on its Inside, which is call'd its *Costa*; as its Edge is call'd its *Spine*. It is united to the Sides of the Three superior *Vertebræ* of the *Os Sacrum* by a true Suture, and appears larger in Women than in Men.

The Second is the *Os Pubis*, being the lower and anterior Part of the *Os Innominatum*, and join'd to its Fellow by an intermediate Cartilage, which makes the fore Part of the *Pelvis*; the *Os Sacrum* being the back Part, and the *Ilia* the Sides.

The Third is the lower and posterior, call'd *Ischium*, or *Coxendix*, having a large Cavity, call'd *Acetabulum Coxendicis*, which receives the Head of the *Os Femoris*. The cumference of this Cavity is edg'd with a Cartilage, call'd its Brow, where it joins the *Os Pubis*. It has a large Hole, call'd *Foramen Ischii & Pubis*, about the Circumference of which the Muscles call'd *Obturator Internus* and *Externus* arise; and at its lower Extremity it has a large Prominency, upon which we sit, and from whence the Flexors of the Leg arise. At its inferior End it has a large Tubercle, from whence the *Extensores* of the Leg have their Rise. A little above this, on its posterior Part, it has an acute Process, betwixt which and the former Prominency lies the *Sinus* of the *Ischium*, through which passes the Tendon of the *Obturator Internus*.

SECT. VIII.

Of the Ribs.

THere are in all Twenty four Ribs, *viz.* Twelve on each Side of the Twelve *Vertebræ* of the Back. They are crooked and almost semicircular, flat and broad as they approach the *Sternum*, but round and thicker the nearer they come to the *Vertebræ*, at which End they have a round Head, which being invested with a Cartilage, is receiv'd into the *Sinus* in the Bodies of the *Vertebræ*, and at the Neck of each Head, (except the Two last Ribs) there is a small Prominency, which is also receiv'd into the *Sinus* of the transverse Processes of the same *Vertebræ*. The Ribs make an acute Angle with the lower *Vertebræ*.

Each of these Ribs has a small *Sinus*, which runs along the under Sides, in which are lodged a Nerve, Vein, and Artery. At their Ends where they are fasten'd to the *Sternum* they are cartilaginous, and the Cartilages make an obtuse Angle with the bony Part of the Rib. The Cartilages are harder in Women than in Men, the better to bear the Weight of their Breasts.

The Ribs are distinguish'd into Two Sorts: The Seven superior are call'd the

True Ribs, their cartilaginous Extremities being receiv'd into the *Sinus* of the *Sternum*; and the Five inferior *Spurious Ribs*, they being both ſofter and ſhorter, and only the Firſt of them join'd to the Extremity of the *Steruum*, the *cartilaginous* Ends of the reſt being faſten'd to one another, thereby giving the more Room for the Dilatation of the Stomach and Intrails. The laſt of the ſpurious Ribs is ſhorter than any of the reſt, and not faſten'd to them, but ſometimes to the *Midriff*, and ſometimes to the *Muſculus Obliquus Deſcendens.* If the Junctures of the Ribs with the Bodies of the *Vertebræ* had been at right Angles, the Concavity of the *Thorax* could not have been extended in Breathing. If each Rib had been a ſolid Bone, join'd at both Extremities to Two fixed Points, the whole Cheſt had been without Motion. If the Ribs had not been articulated to the tranſverſe Proceſſes of the *Vertebræ*, the *Sternum* could not have been thruſt out ſo much as it is now, and the Cavity of the *Thorax* could not have been ſufficiently enlarged for Inſpiration: For when the Ribs are pull'd up by the Intercoſtal Muſcles, the Angle which the Cartilages at the *Sternum* make with the bony Part of the Rib, muſt be encreaſed, and conſequently its Subtenſe, or the Diſtance between the *Sternum* and the tranſverſe Proceſſes lengthen'd. And becauſe 'tis impoſſible the Rib ſhould move beyond the tranſverſe Proceſs, (by Reaſon of its Articulation with it) the *Sternum* muſt either be thruſt on the other Side, or elſe outwards. It cannot be thruſt on the other Side, becauſe of an equal Preſſure there, and therefore of Neceſſity moves outwards, or, which is the ſame Thing, the Diſtance between the *Vertebræ* and the *Sternum* is enlarged. Hence it is, That the ſpurious Ribs, which do not reach the *Sternum*, and contribute nothing to this Action, are alſo not articulated with the tranſverſe Proceſſes.

Suppoſing the Concavity of the *Thorax* to be half a *Sphæroide*, whoſe Semi-Axis is the Heighth of the *Thorax*, or 15 Inches, and the Diameter of its greateſt Circle 12 Inches, then the Cavity of the *Thorax* contains 1130 Cubick Inches. But in an eaſie Inſpiration the *Sternum* is rais'd One Tenth Part of an Inch, (whereof I am convinc'd by an exact Experiment) and conſequently the Concavity of the *Thorax* enlarged to 1150 Cubick Inches: Unto this if you add the Space the *Diaphragma* leaves, which is the Segment of a Sphere, whoſe Diameter is 15 Inches, and the Solidity of the Segment 183 Inches, you will have 22 Inches more, ſuppoſing the *Diaphragma* to deſcend but one Inch; but if it deſcends an Inch and half, it leaves room for 52 Inches of Air to enter; and if it deſcends Two Inches, the Cavity of the *Thorax* will be enlarged, upon the Account of the Motion of the *Diaphragma*, alone 86 Inches: So that in the leaſt Inſpiration we can fairly ſuppoſe the Lungs are diſtended with 42 Inches of Air; and they may be ſometimes with above 70 or 100.

SECT. IX.

Of the Breaſt-Bone.

THE *Sternum*, or Breaſt-Bone, is plac'd in the Middle of the Breaſt, and conſiſts of 7 or 8 Bones in Infants, which being cartilagineus, harden and unite into Three Bones after they are Seven Years old; though even after that the Subſtance of theſe Bones remains ſomewhat ſpongeous.

The uppermoſt of theſe Bones is the biggeſt and largeſt, being unequal and rough on its Outſide, but ſmoother on its Inſide; where it has alſo a ſhallow Furrow, that gives Room for the Deſcent of the Wind-Pipe. It has a *Sinus*, inveſted with a Cartilage, on each Side of its ſuperior Extremity, wherein it receives the Heads of the Channel-Bones.

The

The next ſucceeding to this is longer and narrower than the former, and has ſeveral *Sinus's* on its Sides, which receive the cartilaginous Extremities of the Ribs. The laſt is ſhorter but broader than the Second; and into its lateral *Sinus's* are receiv'd the Ends of the laſt true Ribs. It terminates into a Cartilage, which ſometimes turns bony, call'd *Cartilago Xiphoides*, or *Enſiformis*, becauſe at its upper Part, where it is join'd to the Bone, it is broad, but grows narrower to its Extremity, where ſometimes it is forked, and ſometimes bends inwards, when it cauſes great Pains and Vomiting by its compreſſing the ſuperior Orifice of the Stomach.

The Uſe of the *Sternum* is to defend the Heart, and to receive the Extremities of the true Ribs.

SECT. X.

Of the Claviculæ, *and* Scapulæ.

THE *Claviculæ*, or Channel-Bones, being Two in Number, are plac'd at the Baſis of the Neck, above the Breaſt, One on each Side, being pretty long, but ſlender, and join'd at One Extremity to the Production of the Shoulder-Blade, call'd *Acromium*, by a *Synchondroſis*, and at the other End to the upper Part of the *Sternum* by an *Arthrodia*. They are crooked like an *Italian* (ſ), for the Paſſage of the Veſſels which paſs under them, and to facilitate the Motion of the Arms.

As their Subſtance is ſpongeous, ſo they are eaſily broken; but for the ſame Reaſon alſo ſooner united. Their Uſe is to ſupport the *Scapulæ*, to which the Arms are articulated: For the pectoral Muſcle, which pulls the Arm acroſs the Breaſt, being inſerted near the upper Extremity of the Bone of the *Humerus*, if the Clavicle did not keep the *Scapula*, to which the Head of the *Humerus* is join'd at an equal Diſtance from the *Sternum*, the upper Part of the Arms, and not the Hand, muſt have been pull'd forwards.

The *Scapulæ*, *Omoplatæ*, or Shoulder-Blades, are Two large and broad Bones, not unlike the Triangle call'd *Scalenum*, and are plac'd on each Side of the ſuperior and poſterior Part of the *Thorax*. Their Subſtance is thin, but ſolid and firm, convex on the Outſide, and hollowiſh on the Inſide. The upper Edge is call'd the *Coſta Superior*, and the lower Inferior. The broad Extremity is call'd the Baſis of the *Scapula*, which with the Two Edges make the ſuperior and inferior Angle. They have each Three Proceſſes, of which, the Firſt runs all along the Middle of their Outſide, and is call'd the *Spine*; and that End of the *Spine* which receives the Extremity of the *Clavicula* is call'd *Acromium*. The Second Proceſs, which is ſhort, and ſharp like a Crow's-Bill, whence it has been call'd *Coracoides*, is a little below the *Acromium*; and theſe Two Proceſſes are faſten'd together by a ſtrong Ligament, which keeps the Head of the *Humerus* in the Cavity of the Third Proceſs, which is call'd the *Cervix*, which Proceſs is the End of the *Scapula*, which is oppoſite to its *Baſis*. It has a round *Sinus*, edg'd with a Cartilage, which receives the Head of the *Humerus*.

The Uſe of the Shoulder-Blade is to receive the Ends of the Clavicles and *Humerus*, to facilitate the Motion of the Arm, and to give Originations to the Muſcles that move the Arm.

SECT.

SECT. XI.

Of the Bones of the Arm *and* Hand.

THE *Humerus*, or Shoulder-Bone, is the Firſt Bone of the Arm, being long and round, its Subſtance or Fibres ſolid and compact, with a pretty large and long Cavity, in which is contain'd the Marrow. Its round Head which is at its upper End is inveſted with a Cartilage, which is receiv'd into the Cavity of the Neck of the *Scapula*. In the fore Part of its Head there is a Channel, in which is lodged the Tendon of the *Biceps*: But becauſe this Head is much larger than the Cavity, there is a ſtrong Ligament, which riſing from the Brim of the Cavity of the *Scapula*, and forming a Coverture round the Head of the *Humerus*, is inſerted between the *Epiphyſis* and the Bone, and thus makes the Articulation of the *Humerus* with the *Scapula*, an *Arthrodia* or Ball, and Socket, that the Arm might have all Manner of Motions. The greateſt Part of the Socket is made of a Ligament: For though the Joint would have been ſtronger if the Cavity had been all of a Bone, nevertheleſs the Neck of the *Humerus* being large and ſtrong, the Compaſs of the Arm muſt have been very ſmall. The inferior Extremity of the *Humerus*, which is thinner but broader than the other, has Two Protuberancies: The external is receiv'd into the Extremity of the *Radius*: From the internal the Muſcles that bend the Hand and Fingers have their Riſe. Between theſe Two Protuberancies there are Two ſmall ſemicircular Prominencies, with a middle Channel, by which the *Humerus* is join'd to the *Ulna* by a *Ginglymus*. On the fore Part of the Protuberancies there is a ſmall *Sinus*, which receives the anterior Proceſs of the *Ulna*: And on the Backſide there is another large *Sinus*, which receives the *Olecranum*.

The *Ulna*, or *Cubitus*, is a long and hard Bone, with a Cavity in its Middle, plac'd on the Outſide of the fore Arm, reaching from the Elbow to the Wriſt, being biggeſt at its upper End, but growing ſmaller to its lower End. At its upper Extremity it has Two Proceſſes, which are receiv'd into the anterior and poſterior *Sinus's* of the End of the *Humerus*. The anterior Proceſs is ſmall and ſhort; but the poſterior, call'd *Olecranum*, is bigger and longer. It ſerves to ſtop the fore Arm when it comes to a ſtreight Line with the Arm. Betwixt theſe Proceſſes there is a ſemicircular *Sinus*, which receives the interior Protuberancy of the lower Extremity of the *Humerus*, upon which we bend and extend the fore Arm. All along the Middle of that there runs a ſmall Ridge, by which this Bone is articulated to the *Humerus* by *Ginglymus*. Had it been by an *Arthrodia*, the Joint would have been much weaker; but the Hand could have received no more Motion from it than it has now from the Shoulder.

The inner Side of this ſuperior Extremity has a ſmall *Sinus*, which receives the Circumference of the round Head of the *Radius*: But its inferior Extremity, which is round and ſmall, is receiv'd into a *Sinus* in the lower Extremity of the *Radius*, and upon this Extremity it has a ſhort and ſmall Proceſs, from whence the Ligaments which faſten it to the Bones of the Wriſt take their Riſe. This Proceſs keeps the Bones of the Wriſt in their Place.

The *Radius* is the Second Bone of the fore Arm, which accompanies the *Ulna* from the Elbow to the Wriſt. In its upper End it has a ſmall Cavity, which receives the exterior Protuberancy of the *Humerus*. The Circumference of this Cavity rowls in the ſmall *Sinus* in the upper End of the *Ulna*. Near its inferior End, which is bigger than the ſuperior, it has a ſmall *Sinus*, which receives the Extremity of the *Ulna*; and in its Extremity it has Two *Sinus's*, which receive

ceive the Bones of the Wriſt. The *Radius* and the *Ulna* touch not one another but near their Extremities, they bending aſunder in the Middle, but being tied together by a ſtrong and broad membranous Ligament.

The upper End of the *Ulna* is the biggeſt, becauſe upon this the Articulation of the Elbow is performed; but the lower End of the *Radius* is the biggeſt, becauſe here only the Hand is articulated. The *Radius* moves either forward or backward upon the *Ulna*, by which Means the Palm of the Hand is turned either upwards or downwards; which Two Motions they call *Pronation* and *Supination*. Neither could any other Articulation have produced theſe Two Motions to the Hand; for though an *Arthrodia* gives a Motion to every Side, yet we cannot by that turn the fore Part of our Arm backwards.

The *Carpus*, or Wriſt, is compos'd of Eight Bones, of a different Size and Figure, being plac'd in Two Rows, *viz.* Four in each; the Firſt being articulated with the *Radius*, and the Second with the Bones of the *Metacarpus*. The laſt little Bone of the Firſt Row is not plac'd at the Side of the Third, which anſwers to the Bone of the *Metacarpus* of the Little Finger, but it lies upon it. They are firmly join'd together by the Ligaments which come from the *Radius*, as alſo by the annular Ligament, through which paſs the Tendons that move the Fingers, unto each of which it gives a particular Eaſe.

The *Metacarpus* conſiſts of Four Bones, which anſwer the Four Fingers, that which ſupports the Fore-Finger being the biggeſt and longeſt. Their Figure is round and long, a little convex toward the Back of the Hand, and hollowiſh and plain toward the Palm. They are alſo hollow in the Middle, and full of Marrow. They touch one another only near their Ends, leaving a Space in the Middle for the interoſſeous Muſcles. In their upper Extremity is a *Sinus*, which receives the Bones of the Wriſt; and their lower End being round, is received into the *Sinus* of the Firſt Bones of the Fingers.

Fifteen Bones belong to the Fingers and Thumb of each Hand, *viz.* Three to each Finger. Towards the Back of the Hand they are roundiſh, but hollow and plain towards the Palm, except the laſt where the Nails are. They are diſtinguiſh'd into Three Ranks, each call'd a *Phalanx*, the Firſt being longer than the Second, and this longer than the Third. The upper End of the Firſt Bone of each Finger has a ſmall *Sinus*, which receives the round Head of the Bones of the *Metacarpus*. The upper End of the Second and Third Bones of each Finger hath Two little *Sinus's*, divided by a ſmall Prominency; and the lower End of the Firſt and Second Bones of each Finger has Two Prominencies, ſeparated by a ſmall *Sinus*. The Two Prominencies are receiv'd into the Two *Sinus's* of the upper End of the Second and Third Bones; and the little *Sinus* receives the ſmall Prominency of the ſame End of the ſame Bones. The Firſt Bone of the Thumb is like to the Bones of the *Metacarpus*, being join'd to the Wriſt and to the Second of the Thumb, as they are to the Wriſt and the Firſt of the Fingers. The Second Bone of the Thumb is like the Firſt Bones of the Fingers, being join'd to the Firſt and Third, as they are to the Bones of the *Metacarpus*, and to the Second of the Fingers. The Fingers are moveable ſideways upon their Firſt Joints only.

They have beſides theſe ſome ſmaller Bones, call'd *Oſſa Seſamoidea*, which are plac'd at the Joints of the Fingers, under the Tendons of the *Flexores Digitorum*, to which they ſerve inſtead of Pulleys. They are reckon'd about Twelve in each Hand.

SECT.

SECT. XII.

Of the Bones of the Thighs, Legs, *and* Feet.

THE Thigh has only One Bone, which is the longeſt of all the Bones of the Body, its Fibres being very cloſe and ſolid. It has a Cavity in its Middle. 'Tis a little round and convex on its anterior Part, but on its Backſide a little hollow, with a long ſmall Ridge, call'd *Linea Aſpera*. At its ſuperior Extremity it has Three *Epiphyſes*, which eaſily ſeparate in Children.

The Firſt is its Extremity, being a large round Head, inveſted with a Cartilage, which is received into the *Acetabulum Coxendicis*, wherein it is faſten'd by Two Ligaments: The Firſt of which ariſing from the Edge of the *Acetabulum*, is pretty large; but the Second coming from the Bottom of the *Acetabulum*, is round and ſhort, and is inſerted into the Middle of the round Head. That Part which is immediately below this round Head, which is ſmall, long, and a little oblique, is call'd the *Neck*; which making an Angle with the Body of the Bone, the Thighs and Feet are by this Means kept at a Diſtance from one another; and we ſtand firmer, the *Linea Propenſionis* eaſily falling perpendicular upon any Part of the quadrangular Space between the Feet: Beſides, this Obliquity of the Neck of this Bone adds to the Strength of the Muſcles of the Thigh, which otherwiſe muſt have paſs'd very near the Center of Motion.

The Second is call'd *Trochanter Major*, being a pretty large Protuberancy on the exterior Side of the Thigh-Bone, juſt at the Root of the Neck. It is rough, becauſe of the Inſertion of ſome Muſcles into it, it having a ſmall Dent at its Root, in which the *Muſculi Quadragemini* and the *Obturatores* are inſerted.

The Third is call'd *Trochanter Minor*, being on the poſterior Part of the Thigh-Bone ſomewhat lower and leſs than the former. Theſe Protuberancies conduce much to the Strength of the Muſcles, by removing both their Inſertions and their Directions from the Center of Motion.

The lower End of the Thigh-Bone, where it is articulated with the *Tibia* by *Ginglymus*, is divided in its Middle by a *Sinus* into Two Heads, *viz.* the external and the internal, which are received into the ſuperior *Sinus* of the *Tibia*. Through that Interſtice that is between the poſterior Parts of theſe Two Heads, paſs the great Veſſels and Nerve that go to the Leg; for the upper Extremity of the Thigh-Bone being articulated by *Arthrodia*, that we might not only move our Legs back and forwards, but likewiſe nearer to or farther from one another, therefore its lower End was united to the *Tibia* by *Ginglymus*, which is the ſtrongeſt Articulation.

On the Knee there is a ſmall round Bone of about Two Inches broad, pretty thick, a little convex on both Sides, inveſted with a ſmooth Cartilage on its anterior Side, which is ſoft in Children, but becomes very hard afterwards. 'Tis call'd *Mola*, *Patella*, or the Knee-pan; and over it paſs the Tendons of the *Extenſors* of the Leg, unto which it is in lieu of a Pulley, to facilitate their Motion, by removing their Directions from the Center of Motion.

The Leg has Two Bones, the inner and bigger being call'd the *Tibia*, or *Focile Majus*, which is hard and ſolid, with a Cavity in its Middle. Its Shape is very near triangular; and its ſharp-edged anterior Part is call'd the Shin. In its ſuperior Extremity it has Two large *Sinus's*, edg'd with a ſoft and pliable Cartilage, call'd the *Cartilago Lunata*, from its Figure. It runs in between the Extremities of the Two Bones, and becomes very thin at its Edge. Like thoſe in the Articulation of the Lower-Jaw, it facilitates a ſmall Side-Motion in the Knee. The *Sinus's* receive the Two Protuberancies of the

Os Femoris

Femur; and the Production which is betwixt the *Sinus's* of the *Tibia* is received into that *Sinus* which ſeparates the Two Protuberancies of the *Femur*. By bending our Knee we bring our Leg in walking in a ſtreight Line forwards, which would not have been effected without this Articulation; but we ſhould have been obliged to have brought about our Foot in a Semicircle, like thoſe that have a Wooden Leg.

At the Side of this upper Extremity it has a little Knob, which is receiv'd into a ſmall *Sinus* of the *Fibula*; and on its anterior Part, juſt below the Knee-pan, it has another, into which the Tendons of the Extenſors of the Leg are inſerted. At its inferior Extremity, which is much ſmaller than the ſuperior, it has a remarkable Proceſs, which forms the interior Ankle, and a pretty large *Sinus*, divided in the Middle by a ſmall Protuberancy. The *Sinus* receives the convex Head of the *Aſtralagus*, and the Prominency is received into the *Sinus* in the convex Head of the ſame Bone. At the Side of its inferior Extremity it has another ſhallow *Sinus*, which receives the *Fibula*.

The exterior and ſmaller Bone belonging to the Leg is call'd *Perone*, *Fibula*, or *Focile Minus*. It is of the ſame Length with the *Tibia*. At its upper End, which is not ſo high as the Knee, it receives the lateral Knob of the ſuperior Extremity of the *Tibia*, into a ſmall *Sinus* which it has in its inner Side. Its lower End is received into the ſmall *Sinus* of the *Tibia*; and then extending it ſelf into a large Proceſs, forms the exterior Ankle, encompaſſing the exterior Side of the *Aſtralagus*. Theſe Two Bones of the Leg do not touch one another but only at their Extremities; the Interſtice which is left in their Middle being fill'd up by a ſtrong membranous Ligament, and ſome Muſcles that ſerve for the Extenſion of the Feet and Toes.

The Foot, properly ſo call'd, is diſtinguiſh'd into Three Parts, *viz.* the *Tarſus*, the *Metatarſus*, and the Toes. The *Tarſus* is call'd the Space between the Bones of the Leg and the *Metatarſus*, and is compoſed of no leſs than Seven Bones: The Firſt among theſe is call'd the *Talus*, or the *Aſtralagus*, having on its upper Part a convex Head, which is join'd with the Two Bones of the Leg by a *Ginglymus*, it being divided by a ſmall *Sinus*, which receives the little Prominency in the Middle of the *Sinus* of the *Tibia*; without which Articulation we muſt in walking have trod upon the Heel with our fore Foot, and upon our Toes with our hind. The anterior Part of the *Talus*, which is convex alſo, is received into the *Sinus* of the *Os Naviculare*. Towards the poſterior Part of its under Side it has a pretty large *Sinus*, which receives the ſuperior and poſterior Part of the *Os Calcis*; but towards the anterior Part of the ſame Side it has a Prominency, which is received into the ſuperior and anterior Part of the ſame Bone. Betwixt this *Sinus* and this Prominency there is a Cavity, which anſwering to another in the *Os Calcis*, contains an oleaginous and viſcous Sort of Subſtance, for moiſtening the Ligaments, and facilitating the obſcure Motion of the Bones when we go.

The Second Bone of the *Tarſus* is the *Calcaneum*, or *Os Calcis*, the Heel-Bone, being the biggeſt of the Bones belonging to the *Tarſus*, and plac'd under the *Aſtralagus*, to which it is articulated by a *Ginglymus*. At its poſterior Part it has a large Protuberancy, which makes the Heel; and in it the *Tendo Achillis* has its Inſertion. At its anterior Part it has a Cavity, which receives a Part of the *Os Cubiforme*.

The Third is call'd the *Os Naviculare*, or *Cymbiforme*, from its Figure, being plac'd between the *Aſtralagus* and the Three *Oſſa Cuneiformia*. Behind it has a large *Sinus*, which receives the anterior convex Head of the Firſt; and before it is convex, and divided into Three Heads, which are received into the *Sinus* of the *Oſſa Cuneiformia*.

The Fourth, Fifth, and Sixth Bones belonging to the *Tarſus*, are call'd *Oſſa Cuneiformia*, from their Figure, being large above, and narrow below, and plac'd all Three at the Side of one another. Their ſuperior Part is convex, and their inferior concave; by which Means the Muſcles and Tendons in the Sole of the Foot are not hurt in walking. At one Extremity they have each a *Sinus*, which receives the *Os Naviculare*, and at the other End they are join'd to the Three inner Bones of the *Metatarſus*. The inmoſt of theſe Bones is the biggeſt, and that in the Middle is the leaſt.

The Seventh and Laſt Bone of the *Tarſus* is call'd the *Os Cubiforme*, from its Figure, being plac'd in the ſame Rank with the *Oſſa Cuneiformia*. On its poſterior Part it is join'd to the *Calcaneum*, or Heel-Bone; on its fore Part to the outer Bones of the *Metatarſus*; and on its Inſide it is united to the Third *Os Cuneiforme*.

The Bones appertaining to the *Metatarſus* are Five in Number: That which ſerves to ſupport the Great Toe is the thickeſt, but that which ſuſtains the next Toe is the longeſt; the reſt grow each ſhorter than another. They are longer than the Bones of the *Metacarpus*, but in all other Things they are like them; and theſe are articulated to the Toes in the ſame Manner as the others are to the Fingers.

Of the Bones belonging to the Toes there are no leſs than Fourteen in each Foot. Of theſe, the Great Toe hath Two, and the reſt of the Toes have each Three. They are altogether like the Bones of the Fingers, except that they are ſomething ſhorter.

Beſides theſe, the Toes have ſometimes alſo their Twelve *Oſſa Seſamoidea*, as well as the Fingers.

SECT. XIII.

Of the Nails, *and Number of the* Bones.

THE Nails, that are found upon the Extremities of the Toes as well as of the Fingers, ſeem to be of the ſame Nature or Compoſition as the Hoofs of other living Creatures. If you take a narrow View of the Hoof of a Horſe, of an Ox or Hog, you will find that it is nothing but a Compoſition of ſmall Husks, which anſwer to ſo many *Papillæ* of the Skin. Whence it ſeems probable, that the Nails are nothing but the Covers or Sheaths of the *Papillæ Pyramidales* of the Skin on the Extremities of the Fingers or Toes, which being dry'd and harden'd, lie cloſe upon one another. Their Uſe is to cover and defend the Extremities of the Fingers and Toes, when we handle or happen to hit accidentally againſt any hard or rugged Body.

Here follows a Computation of all the Bones of a Skeleton.

The *Os Frontis*,	1	*Vertebræ Cervicis*	7	The *Os Femoris*,	2
Occipitis,	1	*Dorſi*,	12	*Rotulæ*,	2
Oſſa Parietalia,	2	*Lumborum*	5	*Tibiæ*,	2
Temporum,	2	*Oſſis Sacri*	6	*Fibulæ*,	2
Oſſicula Auditus,	8	*Os Coccygis*	3	*Oſſa Tarſi*,	14
Os Ethmoides,	1	*Scapulæ*,	2	*Metatarſi*,	10
Sphænoides,	1	*Claviculæ*,	2	*Digitorum*,	28
Mali,	2	*Coſtæ*,	24		60
Maxillare,	2	*Sternum*,	1		
Unguis,	2	*Oſſa Innominata*	2	In all,	245
Naſi,	2		64		
Palati,	2				
Vomer,	1	The *Humerus*,	2		
Maxilla Inferior,	1	*Ulnæ*,	2		
Dentes Inciſivi,	8	*Radius*,	2		
Canini,	4	*Oſſa Carpi*,	16		
Molares,	20	*Metacarpi*,	8		
Os Hyoides,	1	*Digitorum*,	30		
	61		60		

Without including the *Oſſa Seſamoidea*, of which there are ſaid to be found to the Number of 48, *viz.* 12 in each Hand and Foot.

Henry

Henry Eyſſon, Doctor and Profeſſor of *Groningen*, his Anatomical, Phyſical Treatiſe of the Bones in Infants; their Preſervation, and Cures.

CHAP. I.

Of the Uſefulneſs of the Infantile Oſteology.

IF a Mother during the Time of Child-bearing happens to diſtort her Body, but eſpecially the *Abdomen*, by diſorderly Flexions, irregular Extenſions and Complications, and expoſes herſelf to Concuſſions, and other external Injuries, the diſmal Effects thereof will of neceſſity appear afterwards in the Bones of the Infant by their vicious Figures. Frequent, laſcivious, and prepoſterous venereal Congreſſes betwixt the Parents, may alſo produce no ſmall Miſchiefs to the Infant.

But ſuppoſing the poor Infants happen to eſcape all theſe Dangers, they ſeem to be, and are too often expoſed to much greater ſtill, during the Time of Delivery, either through the Fault of the Mother, or the Midwife; for ſometimes both, or perhaps one of them, are over-eager in forwarding the Birth of the Child; and the Mother, by ſpending her Strength before the due Time, afterwards is unable to go through the Fatigues and Pains of her Labour. Sometimes the Midwife does conſiderable Miſchief to the cartilaginous Bones (if ſo I may call them) of the Infant, by handling it too roughly and unskilfully. And after it is brought into the World, What is more common than to ſee their tender ſmall Bones, and their Appendages or Proceſſes, to ſuffer Diſtortion or Diſlocations by the unskilful Management or Neglect of their Nurſes, either in rowling, handling, carrying, or dreſſing them; in putting them too ſoon, or elſe after a prepoſterous Manner, upon their Legs; in ſhaking them too violently? *&c.*

Infants being ſubject to all theſe Miſchiefs and Dangers, 'tis manifeſt, that in ſuch like Caſes we muſt have Recourſe to the Skill of any able Chirurgeon, ſuch a one as knows how to remedy thoſe Things by manual Operations. But how can he be ſuppoſed to attain to this Knowledge and Ability, unleſs he be exactly inſtructed in the Poſition and Connexion, not only of the ſolid Bones in adult Perſons, but alſo of the more tender Bones in Infants; as alſo of every thing elſe that has a relation to their Bones, or to that which is to turn afterward into an oſſeous Subſtance? For unleſs a Chirurgeon be well inſtructed in and acquainted with the Structure and Poſition of the ſolid Parts of the tender Bones, as well as of the Cartilages and cartilaginous *Epiphyſes*, he will never be able by all his Dexterity to reduce into their proper Places and Situation, either the *Epiphyſes* when they are ſeparated from the main Bone, or the Diſlocations in the Bones themſelves, nor reſtore any diſtorted Part to its natural Figure; nor (what is of greater Conſequence than

all the reſt) will he be qualified to reinſtate the *Cranium* or *Thorax*, when they have ſuffered a preternatural Compreſſion, into their natural Form and Capacity.

This is the chief if not the only Motive that did induce us to enter upon an exact Scrutiny of this Nature, when an Opportunity of ſo doing was offer'd to us by the Senate of this City, who having preſented our Univerſity with a Corps of an Infant, I did not only diſſect and ſearch into its Compoſition and Structure in private, but alſo after having cleanſed the Bones, and fitted them up again into a Skeleton, did reſerve it for ſeveral publick Lectures, where I had a fair Opportunity of ſhewing to my Auditors the Difference there is betwixt that of an Infant and that of adult Perſons, by comparing them with one another.

The Oſteology of Infants (beſides this) does alſo lead us into that moſt abtruſe Scrutiny of the moſt wonderful Methods and Steps taken by Nature in framing and perfecting the more ſolid Parts of our Bodies: For in the larger Bones of the *Cranium*, to wit, in the *Oſſa Frontis*, *Sincipitis*, and *Occipitis*, we may diſcern certain *Striæ* of the moſt minute oſſeous Filaments, which having their Riſe from one ſolid Center, (as we may term it) not only compoſe the Firſt *Stamen* of the bony Subſtance, but alſo ſhew us how this ſtaminous Matter is propagated. In the ſame Bones we may here and there diſcover alſo certain ſolid Denſities, diſtinct from theſe *Striæ*, divaricated and ſeparated from one another. In the ſame Bones the moſt manifeſt Propagation of theſe *Striæ* toward the Circumferences and Extremities, afford us ſufficient Reaſon to imagine in what Manner the Sutures are formed there, to wit, That from the mutual Concourſe and Intercourſe of theſe propagated *Striæ*, there ariſes a moſt wonderful Implication of theſe interjoin'd Bones. Thus alſo the adjacent and circumjacent Cartilages to ſeveral other Bones, when they begin to approach to ſome Degree of Solidity in Children, plainly convince us, That the Hardneſs and Firmneſs of the *Epiphyſes*, and the other Cartilages, whenever they begin to oſſify, do not take their Origin from the ſame Bone unto which they are adjoin'd, but from the Middle or Center of their own Body, which being oſſify'd firſt, ſpreads its Oſſification, and extends its Solidity and Firmneſs gradually towards the Circumference, till at laſt it turns it into a perfect, ſolid, bony Subſtance. There are alſo ſuch apparent Signs of the Rudiments of the Teeth in the *Alveoli* of the *Maxillæ*, as leave us no room to doubt but that they are progenerated in the Womb. But above all Things, the *Oſteology* of the Infants repreſents both to our Eyes and to our Minds ſuch ſtrong Reaſons, as ſufficiently convince us, That the Extruſion of the Child in the Birth, as it has ſomething in it that may very well raiſe our Admiration, ſo on the other Hand we need not with *Galen* proclaim the ſame to be paſt all humane Knowledge and Diſcovery.

For though it be true, That the Infant has a very narrow and ſtreight Paſſage into this World, nevertheleſs it is of a pliable Nature, and ſubject to Dilatation; beſides that, in the Infant it ſelf there is ſuch a happy Compoſition and Diſpoſition of many of the Parts, as that, ſetting aſide any accidental Obſtacles, the Infant it ſelf is mainly inſtrumental in its Delivery during the Time of Parturition: For not only the ſoft and flexible Bones of the Head are apt to accommodate themſelves by their Pliableneſs to the ſtreight Paſſage of the Orifice of the Womb, but alſo may remarkably contract themſelves one above the other by reaſon of the Multiplicity of their Sutures and Interſtices. The Narrowneſs of the ſuperior Ribs does not only facilitate the Depreſſion of the *Scapulæ*, the *Claviculæ*, and the *Humerus* it ſelf, but the lowermoſt Ribs alſo being contracted towards the *Abdomen* and the *Epigaſtrium*, do occaſion alſo an equal Compreſſion of the Breaſt lengthways. The whole *Series* of the *Vertebræ* being deſtitute as yet of their *Spinous* Proceſſes, not only make their Way eaſie, without any Obſtacle, but alſo the pliable Cartilages of the Ribs and the whole *Sternum* are very ſubſervient to this Work. The large Frame of the Bones of the *Ileon* being on all Sides tied together with looſe Ligaments, (if ſo they may be call'd) by its Contraction ſtreightens not only the *Pelvis*, but alſo the cartilaginous Heads and Additaments of the *Oſſa Femorum* being forced inwards within the deep

deep cartilaginous Cavities of the *Acetabula*, do by this Means open a free Paſſage both to themſelves and to the Legs alſo.

There is another Advantage ſtill depending on the *Oſteology* of Infants; foraſmuch as this Knowledge, founded upon undeniable ocular Demonſtrations in the Skeleton of an Infant, does moſt manifeſtly convince us how an Infant, even at its full Growth, may be contained commodiouſly enough within the ſtreight Compaſs of the Womb: For if we conſider, that its Bones are not only very ſoft, and divided into ſeveral Parts, but alſo that ſome of them which are ſomewhat longer and hard, have their ſoft *Epiphyſes*, and that others at the ſame time, which are of a leſs Size, and round, are altogether cartilaginous. Hence it is, that the whole Body of the Infant is capable of contracting and conglomerating it ſelf, as it were, into a globular Figure. And in this Reſpect we ought again to admire the Providence of GOD, who, by giving ſuch a Structure to the Body and its Parts, has provided both for the Security of the Infant whilſt it is confin'd to ſo narrow a Compaſs, and of the Mother whilſt ſhe is carrying this Burthen within the Womb. But it is time to proceed from theſe general Heads to a more particular Account of the *Oſteology* of Infants.

CHAP II.

Of the Sutures of the Head.

THE Diverſity and Multiplicity of the Bones of the *Cranium* in Infants, ariſing from, or being at leaſt beſt diſcovered by the Varieties of the Sutures, we will, after the Example of ſeveral moſt celebrated Anatomiſts, give the Precedency to the Account of the Sutures, before that of the Bones.

There are Two Sorts of Sutures or Articulations of the Bones of the *Cranium* in adult Perſons, to wit, the *proper* and *true*, and the *ſpurious* or *imperfect* Ones. Of the *true* there are Three, *viz.* the *Coronalis*, the *Sagittalis*, and the *Lambdoidalis*. The *ſpurious*, which lie upon others in the Nature of ſmall Lamels, are particularly obſervable in the *Oſſa Temporum*. In reference to theſe Sutures, there is a remarkable Diverſity in Infants, in relation to their *Conjunction*, their *Protenſion*, and to their *Number*. As to the Firſt, there are no *Suturæ Serratiles* in Infants, becauſe their Bones have not any cloſe Implications by Way of *Indentation*; but thoſe which we find in adult Perſons to be mutually interjoin'd in the Nature of the Teeth of a Comb, are only extended here at their Length near one another in a ſimple Line; and therefore, according to the general Opinion of the Anatomiſts, ought rather to be call'd an *Harmonia*; and conſequently the Sutures in Infants muſt be diſtinguiſh'd only into *Harmonical* and *Squamoſæ*. But ſeeing that even in the Bones of this new-born Infant there are extant certain Tooth-like Productions, eſpecially above the Membrane of the *Fontanella*, on the Edges of the *Oſſa Frontis*, which afterward turn into cloſe Indentations, as we told you before; we choſe rather not to introduce any new Diſtinction. Beſides, in the ſame Conjunction of the Bones, which in adult Perſons are united by the Implication of theſe cloſe Indentations, there is to be obſerv'd a greater Laxity in their harmonical Sutures; which though it is owing to the Want of that mutual Ingreſs or Indentation, yet ſerves for this End, that it tranſmits the Production of the *Craſſa Meninx* to form the *Pericranium*, as alſo to accelerate the Birth of the Infant, by rendring the Head ſubject to a Compreſſion in Parturition. In reſpect to their Conjunction it is further obſervable, That the imperfect and as it were mangled Extremities of the *Oſſa Frontis*, *Syncipitis*, and *Occipitis*, have in divers Places their vacant Interſtices

terſtices or Spaces, which are nevertheleſs fill'd up by the intervening Membranes. Such like Interſtices are obſervable alſo betwixt the *Oſſa Temporum*, *Sincipitis*, and *Frontis*; betwixt the *Oſſa Occipitis*, *Sincipitis*, and the *Petroſum*; betwixt the *Os Occipitis* and the *Harmonia Sagittalis*; but above all the reſt, betwixt the *Oſſa Frontis* and *Sincipitis*; the laſt of which has obtained the Name of the *Fontanella*, and is commonly call'd, (according to the *Dutch* Dialect) the *Opening of the Head*. This remarkable *Hiatus* is eaſily obſervable in young Children even whilſt they are alive, both by the Touch and by the Sight, being by its pulſatile Palpitation obvious both to our Fingers and to the Eyes. As to its Figure, it is in new-born Infants a *Rhomboides*; for its unequal *Latera* being made by the Extremities of Four Bones, terminate in oblique Angles. As long as this *Fontanella* is not cloſed together, it is covered by the intervening thick Membranes.

And here ariſes a Queſtion, *viz.* Whether in Proceſs of Time theſe Membranes degenerate into a bony Subſtance and Solidity, or whether the Bones of the *Bregma* and of the *Frons* promote their Union by expanding by degrees their oſſeous Solidity? But conſidering that the Membranes which fill up the Vacuity of the *Fontanella*, are nothing elſe but a Reduplication and Reflection of the *Menynx Dura*, which forms the *Pericranium*, and that there are manifeſt Indentations in theſe Bones which extend over the Membrane, it ſeems moſt probable, that the Edges of theſe Bones being extended, in Proceſs of Time fill up and conſolidate this Interval. Some will have it, that this Conſolidation does happen at the ſame Time when the Child begins to ſpeak plainly and diſtinctly. But conſidering that the articulate Pronunciation of a Child has not the leaſt Relation to the Bones of the *Cranium*, and that there are not wanting Inſtances of adult Perſons of 26, nay, of ſome of 40 Years of Age, who have ſtill retain'd this Aperture in the *Cranium*, and who doubtly could ſpeak very plain; I do not ſee the leaſt Reaſon why this ſhould be taken for a conſtant Truth.

See *Bartholin. Anat. Ref. l. 4. c. 6.*

Some have been very inquiſitive concerning the Uſe of this Aperture, and will needs have it to have been deſigned for the better Tranſpiration of the Vapours through this Membrane. But ſince moſt of the Bones of the *Cranium*, or at leaſt many of the Parts belonging to them, are by the conſpicuous Diſpoſition of their *Striæ* better adapted for the tranſmitting of Vapours, though never ſo groſs; I do not ſee why we ſhould be very ſollicitous in diſcovering any other Uſe for this Aperture, beſides what we have mentioned before, *viz.* to facilitate the Compreſſion of the Head of the Child in Parturition.

As to the *ſpurious* Sutures, to wit, the *Squamoſæ* and *Harmonicæ*, there is nothing that requires any peculiar Obſervation in Infants, they not differing from adult Perſons, excepting in their Number, of which more hereafter.

But beſides the beforeſaid Diverſity which appears in the Sutures, or Manner of Conjunction of the Bones in Infants, there is ſtill another Difference to be obſerved in their Sutures, relating to their Protenſion; for they are extended much longer than in the Skulls of adult Perſons: But this Difference in their Protenſion is apparent only in the *Sutura Sagittalis*; for 'tis this Suture only that not only divides, or as it were cuts aſunder, the *Oſſa Bregmatis* in a ſtreight Line betwixt the *Coronal* and *Lambdoidal* Sutures, but alſo taking its Courſe forward below the *Coronal* Suture through the *Os Frontis*, inſinuates it ſelf into the *Harmonia* which divides the Back of the Noſe. Such like Protenſions of the *Sutura Sagittalis* are ſometimes obſerved alſo in adult Perſons: And Mr. *John Nyhoff*, a very ingenious Chirurgeon of this Place, has by him a *Cranium* wherein it is very conſpicuous; but this happens not very often: Whereas *Fallopius (Obſerv. Anat.)* poſitively tells us, That the Propagation of this Suture is always to be obſerved in Infants that are not above a Year old.

Neither muſt we ſuppoſe this Propagation to continue thus in the Heads of Women only; this muſt be look'd upon as a vulgar Error, it being ſufficient for us to ſhew, That it is demonſtrable in the Oſteology of Infants, and that it is deſigned for the

the easier Compression of the Head of the Infant in Parturition.

It is also very well worth our Enquiry, What may be the Reason, that whereas the other true Sutures, to wit, the *Sagittalis*, as far as it extends it self betwixt the *Coronalis* and the *Lambdoidalis*, and even these Two also, should be join'd by Tooth-like Indentations? But this we have spoken of should quite disappear, (at least in most adult Persons) without leaving as much as a Mark behind them. If in a Case of this Nature we may be permitted to ground our Opinion upon Conjectures, it seems as if Nature, by giving to the *Os Frontis* this Solidity and Smoothness, had a Regard both to the Strength and Ornament of the Forehead in Men: For the Forehead being frequently exposed to external Injuries, if it had been conjoin'd by a slight Suture, the Brain would have been subject immediately to no small Danger from Blows, Falls, or any other external Violences that might affect the Forehead. Besides, it being requisite that the Forehead should be smooth, and without any Inequalities, this could not be expected unless it had been also without any Sutures.

There arises, besides this, another Dispute among the Anatomists, to wit, Whether this same Suture does extend it self backwards also into the *Os Occipitis*, nay, even quite through it to the very *Foramen* of the *Occiput*, through which the Spinal Marrow descends?

As to the First, *viz.* Whether the *Sagittalis Sutura* does extend it self into the *Os Occipitis*? It is an undoubted Truth, which is confirm'd by ocular Demonstration in the Skeleton that is now before us, where we may behold on the Extremity and the superior Point of the Bone of the *Occiput*, near the *Sutura Sagittalis*, where it joins with the *Lambdoidalis*, a parallel Fissure or Aperture, being not covered by any intermediate Membrane. And *Fallopius* tells us, That the same is observable almost in all Infants that are not above Six Months old. But nevertheless it does not appear by all this, that this Aperture must be the Production of the *Sutura Sagittalis*: And I am rather apt to imagine, that it is a peculiar Aperture belonging to the *Os Occipitis*, to facilitate its Angustation in the Birth of the Infant: For it is not made by the Extremities of the *Striæ* that meet one another, but rather owing to the Defect of some of these *Striæ*, which are not as yet propagated as far as the Point of the Bone. Neither are the Edges of this small Aperture closed together by an intermediate Membrane, as it happens in that in the *Frons*, and the *Vertex* of the Head; and therefore I am very ready to concur with *Fallopius* in the same Opinion, to wit, That this Aperture of the *Os Occipitis* terminates at the *Sutura Sagittalis*.

According to this Supposition, it will be no difficult Task to answer the Second Part of the Question: For if this most manifest Aperture in the *Os Occipitis* is no Propagation of the *Sutura Sagittalis*, much less can it be supposed to continue its Course to the very *Foramen* of the Spinal Marrow. Nay, this Fissure cannot divide the *Occiput* transversely from the superior Point of the *Os Occipitis* to the *Foramen* of the Spinal Marrow, because from the Middle, or as it were from the Center of this *Os Occipitis*, its staminеous *Striæ* are dispersed to all its Parts; so that if this Aperture did divide the whole Bone, it must also divide the very Center and Principle of the *Striæ*, which is repugnant to the First Generation and Propagation of the *Stamen* of the Bones, such a one as is observable also in the other Bones of the *Cranium*.

Coiterus indeed tells us, That *Fallopius* had once in his Life-time observed the *Sutura Sagittalis* in Infants to extend it self through the Middle of the *Os Occipitis* to the very *Foramen* of the Spinal Marrow: But since it is evident, That *Fallopius* is of a quite contrary Sentiment in this Point, *Coiterus* must perhaps have taken this upon Hearsay.

Lastly: Now we are treating of the Difference there is betwixt the Sutures of Children and adult Persons, we must say something of that also which relates to their Number, wherein they exceed those of Adults: For, besides those they have common with them, there are to be seen in the Heads of Infants, *First*, the Protension of the *Sutura Sagittalis* in the *Os Frontis*: *Secondly*, in the First *Os Occipitis*, the Suture-like superior Fissure, and betwixt this and the Second

cond and Third, as alſo betwixt theſe Two laſt and the Fourth Bone of the ſaid *Occiput*, the harmonical Connexions: *Thirdly*, in the *Oſſa Temporum*, betwixt their *Pars Squamoſa* and *Petroſa*, as alſo betwixt the *Concha* of the *Os Petroſum*, or *Auditorium*, and that Part of the *Oſſa Temporum* and the bony Circle which ſupport the Membrane of the *Tympanum*, certain orbicular *Harmoniæ*: *Fourthly*, in the Third Bone of the *Maxillæ Superior*, which makes the greateſt Part of the Palate, at the Beginning of the Palate, from one of the laſt Teeth of the *Inciſores* to the other laſt Tooth of the ſame *Inciſores*, certain *Sigmoidal* Lines, which encloſe the Four Teeth call'd the *Inciſores*: And *Fifthly* and Laſtly, in the Middle of the inferior *Maxilla*, and of the *Mentum*, there is one Fiſſure, and on both Sides, where the *Maxilla* riſes up into the *Proceſſus Coronides*, there are other Diviſions, partly *Harmonicæ*, partly *Squamoſæ*, (which, as far as I know, were never mention'd by others); all which deſerve our peculiar Obſervation and Enumeration. There are ſometimes ſome other *Fiſſures* obſervable alſo in the Bones of the *Cranium*; but theſe being only ſuperficial, cannot be number'd among the actual Sutures, or elſe happen very rarely, and are ſometimes alſo to be ſeen in the Heads of adult Perſons.

CHAP. III.

Of the Bones of the Head.

BEfore we enter upon a particular Enquiry into the Bones of the *Cranium* of an Infant, we ought to adverti ſe our Reader, by way of Caution, That ſeeing moſt, if not all the Bones of Infants are imperfect, and many of them cartilaginous, and very thin and tender, they are deſtitute of many Cavities, *Sinus's*, *Foramina*, Proceſſes, and other Prominencies, and that thoſe they have are very imperfect, as will appear more particularly from the following Account of the infantile Bones. There is another general Obſervation belonging to the Bones of the *Cranium* of an Infant, *viz.* That they are very thin in new-born Children, and therefore as pliable as Wax, and will give way to the leaſt Preſſure: That they have no double *Laminæ*, or Tables, and are deſtitute of that Fungoſity of the *Diploes* that is betwixt theſe *Laminæ* in Adults.

Riolan (Encheir. Anat. Pathol. l. 1. c. 27.) ſays, That the *Oſſa Occipitis* in Infants are the thinneſt of all; quite contrary to what is obſerved in adult Perſons; but that their *Oſſa Frontis* are thicker than the reſt. But though in the Firſt Bone of the *Occiput* (which is that *Riolan* points at) there are here and there ſome very thin Places, yet its main and middle Part, eſpecially that towards the *Foramen* of the Spinal Marrow, exceeds in Thickneſs all the other Bones of the ſuperior Part of the *Cranium*, and even thoſe of the *Frons*: For that Thickneſs which is obſervable in the *Os Frontis*, eſpecially at the Sides of the *Sutura Sagittalis*, ſeems to ariſe rather from the Duplicity of the *Lamels*, than from the Bulk or Subſtance of the Bone it ſelf.

The *Oſſa Frontis* ſeem to have by this time obtained ſome Degree of Duplicity above the Noſe, which ſeems to be apparent not ſo much by their Thickneſs as by certain ſmall Apertures, which are penetrable into the interior Cavity of the *Cranium*, but ſo as not to tranſmit even the Point of a Pin. Here we may with our Eyes diſcover the Rudiments of the double *Laminæ*. At the ſame Time we take it for an undoubted Truth, what has been aſſerted as ſuch by moſt of the Anatomiſts, to wit, That there is no ſinuous Cavity betwixt this Duplicity, ſuch as is obſervable in the *Cranium* of adult Perſons. The *Oſſa Frontis* have alſo this peculiar, That they conſiſt of Two Bones being

being divided by the Production of the *Sutura Sagittalis*; as has been ſhewn before.

In the Bones of the *Synciput*, or of the *Bregma*, there is nothing worth our particular Obſervation excepting their unequal Extremities, eſpecially about the *Fontanella*. But the *Oſſa Occipitis*, beſides what has been ſaid concerning their Apertures and Thickneſs, deſerve alſo our Conſideration, in reſpect of their Diviſion and Number: For they do not conſiſt of one Bone only, as in Adults, but of Four diſtinct Parts. The Firſt is that entire and ſuperior Expanſion of the broad Part of the *Occiput*, which is ſurrounded by the true Divarications of the *Sutura Lamdoidalis*. The Second and Third make up the *Latera* of the great *Foramen* through which the Spinal Marrow deſcends. And the Fourth is that Part, which being ſituated betwixt the Second and Third, ſurrounds and cloſes the fore Part of the ſame great *Foramen*. 'Tis true, *Riolan* ſays, That he could never diſcover this Fourth Part of the *Occiput*; but notwithſtanding this it is very apparent, That if we will have that great *Foramen*, through which the Spinal Marrow takes its Paſſage, to appertain to the *Os Occipitis*, this muſt be number'd alſo among its Bones, ſince it contributes its Share towards forming the Circumference of that *Foramen*. Neither can I ſee any ſufficient Reaſon why *Riolan* ſhould rather reckon it among the Parts belonging to the *Os Sphænoides*, or *Cuneiforme*, they being united only by a very ſlight Connexion, and eaſily ſeparable; whereas this Part we ſpeak of adheres very cloſe to the Second and Third Parts of the ſaid *Oſſa Occipitis*.

In the *Oſſa Temporum* there is alſo ſuch a remarkable Diverſity, as very well deſerves our Obſervation and Attention, in that it not only conſiſts of Two Parts, but alſo that in one of them there is a Defect of ſome Things, and a Superfluity of others: For the *Oſſa Temporum* are moſt evidently ſeparated into Two Parts; One of which, *viz.* that which forms the *Tempora* in a ſtrict Senſe, and which is commonly call'd the *Squamoſum*, has nothing that is particular, either in reference to the main Bone it ſelf, or in reſpect to the *Proceſſus Zygomaticus*. But the other Part, commonly call'd the *Petroſum*, is deſtitute of the *Appendix Styliformis*, of the *Apophyſis Mammillaris*, as likewiſe of the external Auditory *Meatus*; for theſe retain their cartilaginous Subſtance for ſome Time: But this Defect is compenſated by Nature by the Addition of a certain oſſeous Circle. This Circle, though it be not entire, but disjoin'd in Part, is coherent to the Edges of the Cavity of the *Tympanum*, by a ſlight Connexion, which is eaſie to be ſeparated, and expands the Membrane of the *Tympanum* it ſelf, annexed to it by an orbicular Connexion, over the Cavity of the *Tympanum*. As to the Cavities of the *Os Petroſum* here, the Diſpoſition of the *Tympanum*, of the *Labyrinth*, as alſo of the *Cochlea*, approaching both in their Magnitude and the Symmetry of their Figure, near to their State of Perfection, challenge not only our particular Obſervation, but alſo our Admiration, as *Veſlingius* has very well obſerv'd; notwithſtanding *Riolan* ſeems to be of a different Opinion, when he ſays, *That the moſt admirable Structure of the Labyrinth is not ſo conſpicuous in Infants as in adult Perſons.*

The Three ſmall Bones belonging to the Organs of Hearing, *viz.* the *Malleus*, the *Incus*, and the *Stapes*, which are contained within the *Concha* of the *Tympanum*, have this peculiar Prerogative even in Infants, That in their ſolid and firm Subſtance, in their Magnitude, and in their Figure alſo, they differ not at all, or at leaſt very little, from what is obſervable in thoſe Organs of Hearing in adult or aged Perſons; which ſeems to be ſomewhat ſtrange at Firſt Sight, to wit, That ſuch ſmall Bones as theſe ſhould have this peculiar Prerogative from the very Birth of the Infant; that whereas all the other Bones improve in Proportion to the Age of Men, in their Solidity and Magnitude, and moſt of them alſo in their Figures, theſe are ſcarce ſubject to any of theſe Mutations. But conſidering that theſe ſmall Bones are ſeparated from all the other Bones or Parts, which could communicate their Nutriment to them, 'tis no ſuch Wonder if they do not receive alſo either none, or at leaſt a very ſmall Augmentation or Alteration in their Conformation; eſpecially ſince it ſeems requiſite, that Infants, even in their moſt tender Age, ſhould be capable of perceiving the Sounds and Voices: And this

Perception did require ſuch a Solidity, Magnitude, and Figure, in thoſe Bones, and in the other Auditory Inſtruments, as is obſerv'd in them immediately after the Birth of the Child.

The *Os Cuneiforme* in Infants is very different from what it is obſerved to be in adult Perſons: For the *Os Cuneiforme* being wedg'd in like a Wedge betwixt the other Bones of the *Cranium*, is always ſingle in Adults, and continuous within it ſelf, not only on its fore Part towards the Palate, but alſo on its Sides towards the *Tempora*: But in Infants it is compoſed of ſeveral Parts. 'Tis the Opinion of moſt of the Anatomiſts, That this *Os Sphænoideum* in Infants conſiſts of Four Parts; but nevertheleſs they vary very much concerning their Number and Poſition: For *Fallopius* (in *Obſerv. Anat.*) and *Coiterus*, who has followed his Footſteps, give us the following Deſcription of the Two Firſt of theſe Parts, to wit, One which is the thickeſt, and which ſeems to be the *Baſis* of the whole Bone, and occcupies almoſt the middle *Baſis* of the Head, where is plac'd what is commonly call'd the *Sella Equina*, deſign'd for the Reception of the Pituitary Gland: The other, which is the broader, and has Two offeous *Alæ*, where the Optick Nerves, whilſt they remain yet united, have their Station, and after they are parted, and proceed towards the Eyes, form their *Foramina*; and theſe Two Parts they ſay are join'd together by a large Cartilage: But ſince there is none, much leſs a large Cartilage, betwixt theſe Two pretended Parts, and that neither I nor ſeveral others have been able to diſcover the leaſt Footſteps of any Diviſion here, notwithſtanding I have taken all the Care that poſſibly I could in examining the *Baſis* of the *Os Cuneiforme* apart, and cleanſing and drying it with the utmoſt Care; but on the contrary have found theſe broad *Alæ* united and coherent on all their Sides to the thicker Part of this Bone; I cannot but be of opinion, That this Bone, which, without any juſt Reaſon, they have thus divided into Two Parts, ought to be taken for the firſt, and one and the ſame Part of the *Os Sphænoides*. 'Tis doubtleſs this that moved *Riolan* to aſſert, in Oppoſition to *Fallopius*, (*Ench. Anat. Pathol. l.* 1. *c.* 27.) That the *Sella Equina*, and the *Apophyſes* deſign'd for the Optick Nerves, were but one Part of the *Os Cuneiforme*.

But though we agree with *Riolan* in this Point, we cannot be of the ſame Opinion with him in what he would have to be the other Part of the *Os Cuneiforme*: For that he might not be compelled to part with his Four Parts belonging to the *Os Sphænoides*, he has made that the Fourth Part which below the *Sella Equina* extends to the *Corona* of the *Occiput*: But this Part, which is plac'd betwixt the *Báſis* of the *Os Cuneiforme* and the lateral Bones of the *Occiput*, muſt be reckon'd among the Parts of the *Os Occipitis*, as has been ſhewn before; and therefore cannot be comprehended within the Number of the Parts of the *Os Cuneiforme*.

But to come to a Concluſion concerning the Number of the Parts belonging to the *Os Cuneiforme*: If I may truſt my own Eyes and Hands, and if Nature does not deceive me, in tranſgreſſing its Rules, and ſporting in the Compoſition of this Infant, it is my Opinion, That the Parts of the *Os Sphænides* muſt be confin'd to Three; ſo that that Part which forms not only the *Baſis* of the *Os Cuneiforme*, but alſo in a manner of the whole *Cranium*, and which by its ſmaller Proceſſes riſing upwards, makes the *Sella Equina*, and by its others, which are ſomewhat broader, and expanded both forward and towards the Sides, ſends forth as it were Two *Alæ*, or Wings, under which the Optick and ſome other Nerves have their Paſſage, be accounted the Firſt and Chief of it; and that the Second and the Third be made by the Proceſſes commonly call'd the *Pterigoidæi*, which being plac'd on the Sides, both to the Right and the Left, are moſt manifeſtly divided into Two Parts, by the Firſt Part that is ſeated betwixt them: And theſe Two Parts form the *Two Wings of a Bat*, which expand themſelves not only backwards behind the Palate, but alſo upwards under the *Zygomata* to the anterior Sides of the *Oſſa Temporum*, to the *Oſſa Frontis*, behind their *Proceſſus Zygomaticus*.

In the *Os Cribriforme* there is not any conſiderable Difference: For in new-born Infants are to be ſeen the offeous Lamels, which divide the Cavity of the Noſtrils like a Partition; as likewiſe the Rudiments of the

Two

Two ſpongeous Bones which adhere on both Sides to this Partition; and of the Two *Squamulæ*, that concur with others in the Compoſition of the Orbits of the Eyes, which, notwithſtanding they are very thin and flexible, and interlin'd and conjoin'd together by Cartilages, have nevertheleſs attain'd the true Subſtance of Bones: And therefore *Coiterus* and *Riolan*, who aſſert this *Os Cribroſum* to be altogether cartilaginous in Infants, are very much in the Wrong.

Nevertheleſs, in this very Bone there is a notable Defect, as well of that *Table* which is perforated like a Sive, ſeated in the Middle of the *Baſis* of the *Os Frontis*, juſt above the Noſtrils, as of that Proceſs, which riſing upwards, is known by the Name of the *Criſta Galli*. Infants are not provided with theſe Two Parts of the *Os Cribriforme*; and yet young Children are ſo far from ſuffering any Thing by this Defect, that on the contrary it turns to their Advantage and Convenience: For in the Womb, the *Fœtus* did not ſtand in need of this Sive-like Table, becauſe it did not enjoy there either any Inſpiration or Expiration of the Air, or had any Occaſion for the Extruſion of the *Mucus* from the Noſtrils. Neither does the Child immediately after its Birth require the Preſence of this *Sive*, becauſe as it does not as yet enjoy any conſiderable Degree of Reſpiration, ſo it does not ſtand in need of its Uſe: Nay, the *Proceſſus Mammillares* of the *Cerebrum* being as yet very ſoft, and in a manner fluid, might eaſily obſtruct the *Foramina* of this Sive, if they did fall ſoon after the Infant is born upon this Sive-like Table; which muſt needs prove of dangerous Conſequence to the poor Infant, eſpecially during the Time of Parturition, when the Child bearing its Head downwards, it muſt of neceſſity ſuffer a Compreſſion, in which the ſoft Subſtance of the Brain muſt conſequently bear its full Share. Beſides, the *Criſta Galli*, which riſes out of this Sive-like Table upwards, would by its pointed Extremity prove offenſive to the ſoft Proceſſes, or to the Membranes wherewith they are inveſted, in caſe either during the Time of Parturition, or immediately after the Infant is born, by Chance or any other Accident, the Head or Brain ſhould ſuffer any Compreſſion, which ſeems almoſt unavoidable.

The Bones of the *Maxilla Superior* in Infants differ not at all, or at leaſt very little, from thoſe in adult Perſons: For their Number is the ſame, being Eleven in all, to wit, the Two *Oſſa Zygomatica*, Two *Lacrymalia*, Two *Maxillaria*, the Two exterior of the Noſe, the Two poſterior of the Palate, and the *Os Vomeriforme*. They are the ſame alſo in their Poſition and Figure; for theſe Bones are plac'd and circumſcrib'd in the ſame Manner as in Adults. Thus the *Oſſa Zygomatica*, which protuberate betwixt the Eyes, the Temples, and Cheeks, are dilated inwardly above into the inferior Part of the Orbits of the Eyes, and the leſſer or exterior Angle; but outwardly and downwards grows ſtreighter by degrees, and form Part of that oſſeous Semicircle under the *Tempora*, which is commonly known by the Name of the *Zygoma*, or the *Os Jugale*. Thus the *Oſſicula Lacrymalia*, which are almoſt as thin as Paper even in adult Perſons, not unlike the Nail of a Finger, (whence each of them has alſo obtained the Name of *Os Unguis*) ſerve for Supporters to the *Caruncula Lacrymalis* in the larger *Canthus* of the Eyes. Thus the Two *Oſſa Maxillaria*, being the biggeſt of all, and ſeated under the Cheeks, expand themſelves inwardly into the Palate, and make up the greateſt Part of it. On the ſuperior Part they, partly by that narrow Paſſage which is betwixt the *Oſſa Lacrymalia* and the *Zygomatica*, enter the Orbits of the Eyes, and lie concealed in the great *Canthus*, and Part of the orbitary Pavement, and partly they aſcend outwardly into the interior *Baſis* of the Noſe. Thus the *Oſſa Naſi Exteriora*, extending themſelves from a broad *Baſis* into an obtuſe Angle to the middle Region of the *Frons*, form the higheſt Part of the Noſe. Thus the poſterior *Oſſicula Palati*, which are plac'd under the Extremities of the *Foramina* of the Noſe, where they enter into the Mouth, are dilated into very ſlender Lamels. And thus, Laſtly, the *Os Vomeris*, being the only ſingle Bone here, and placed above that *Rima* of the Palate, and extending it ſelf to the *Baſis* and the Body of the *Os Cuneiforme*, does not only divide the Ca-

vities of the Noſtrils below, but alſo ſerves for a Prop to their other Partition or *Septum.*

The Congruity which is obſerved in theſe Bones betwixt Children and adult Perſons, in their Number, Situation, and Figure, ſeems to be a peculiar Contrivance of Nature, to give to new-born Children a compleat Conformation of the Features in their Faces; by way of Compenſation for the Troubles and Fatigues the Mother is forced to undergo during the Time of her Child-bearing and Parturition: For nothing certainly can be more agreeable to a Woman, than to ſee her Child, after all the Troubles and Pains ſhe has ſuffered, of a handſome Aſpect; as on the contrary, there can be no greater Affliction to a Mother, than to find the new-born Babe to carry about its Face ſome particular Marks of Deformity, which muſt needs have happen'd if any of theſe Bones had either been wanting, or there had been any more than now there are; conſidering that the Interſtices which muſt have been betwixt the Bones, would have occaſion'd to Diſtortions in the Birth of the Child, which would have proved of the worſt Conſequence, becauſe the diſtorted Bones of the Face, or their preternatural Protuberancies or Separations, are not eaſily to be reduced to their natural Poſition, becauſe they cannot be moved on all Sides, either by the Hands, or by the Help of Inſtruments; ſo that, as the Child did advance in Years, its Deformity would become more conſpicuous. And as doubtleſs this Reaſon holds good, at leaſt in reſpect to thoſe Bones of the ſuperior *Maxilla*, which belonging either altogether or in Part to the Face, are cover'd with Muſcles; ſo the other Bones alſo of the ſame *Maxilla*, or their Parts, do agree in Children with the Bones of adult Perſons, or with the Parts of theſe Bones, both to make the Orbits of the Eyes the ſtronger, and keep the Eyes within the Orbits, and to expand themſelves for the better Formation and Support of the Arch of the Palate; both which was abſolutely neceſſary in Infants: So that provident Nature has not without very weighty Reaſons given this Privilege to the Bones of the ſuperior *Maxilla*, to be the ſame in their Number, Poſition, and Figure, with thoſe of adult Perſons.

Before we come to the Bones of the inferior *Maxilla*, let us take a View of thoſe Bones alſo that form the Orbits of the Eyes; not that they are peculiar Bones, and diſtinct from thoſe we have given you an Account of before, but becauſe they form a peculiar Chamber or Receptacle for the Eyes. The Orbit of the Eye conſiſts of Six Bones; Four of which are Parts of other Bones, and Two as it were peculiar to it: For the *Os Frontale* expanded and reflected inwardly, makes the upper Arch of the Orbit: Its exterior *Canthus* is formed by Two Bones, to wit, partly by the *Proceſſus Temporalis* of the *Os Cuneiforme*, dilated and incurvated towards the Eye, betwixt the *Baſis* of the *Os Zygomaticum* and the Arch made by the *Os Frontale*, partly by the *Baſis* it ſelf of the *Os Zygomaticum*: But the Pavement of the *Orbita*, or at leaſt the greateſt Part of it, is made by the *Os Maxillare*, properly ſo call'd, extending it ſelf with a broad Flexion betwixt the *Baſis* of the *Os Jugale*, and betwixt the Lamels of the *Os Lacrymale* and the *Ethmoides*. Laſtly, the *Pariet.* of the larger Angle or *Canthus*, is form'd partly by the *Os Lacrymale*, partly by the *Squammula* of the *Os Spongioſum*. Theſe Two laſt Bones we account as peculiar to the Orbit; for though the *Os Lacrymale* is reckon'd among the Bones of the *Superior Maxilla*, and the *Tabula Squammoſa* to be a Part of the *Os Ethmoides*, they are nevertheleſs not actually propagated from theſe Bones, but only adhere to them. Neither is there any Thing in theſe Bones of the Orbits in which they differ from thoſe of adult Perſons, unleſs it be in the Subſtance of the *Os Lacrymale*, which being very thin even in Adults, 'tis much thinner, ſofter, and more pliable in Infants.

In the Bones of the inferior *Maxilla*, there is a remarkable Difference betwixt thoſe of young Children and adult Perſons: For in Adults it degenerates into One Bone, but in Infants it is divided into Two Parts, by the intervening *Sutura Harmonica* in the *Mentum*. Neither is this Diviſion in the inferior *Maxilla* without its Uſe in the Birth of the Child; for in its Firſt Attempt of paſſing

paſſing through that ſtreight Paſſage with its Head downwards, theſe Bones being by their Diviſion apt to give Way inwardly, they facilitate the Egreſs of the tender Head out of the Womb: For had the *Maxilla* been only One ſolid Bone, it could not have given way, but would have prov'd an Obſtacle in the Birth to the Head and the whole Infant, eſpecially if the *Maxilla* it ſelf ſhould have hit againſt the Sides.

Beſides this Diviſion, which is commonly known and obſervable in all young Infants, there is another Fiſſure which offers it ſelf here in the Bones of both the inferior *Maxillæ* in this our Skeleton, never obſerv'd or deſcrib'd before, to wit, almoſt in the Middle of each of theſe Bones, where it has a thickiſh Protuberancy, and begins to be broader and ſmoother, there appears a Fiſſure, or a Divulſion, which was coherent, but ſo ſlightly, partly in the Nature of an harmonical, partly of a ſquammoſe Suture, that when I cleanſed the Bones, they fell aſunder at the Firſt Touch in the left Side of the *Maxilla*: I imagin'd at firſt that I had broken the tender Subſtance of the Bone; but when I began to adapt one Bone to another again, and at the ſame time took Notice of juſt ſuch another Coheſion in the ſame Place of the oppoſite Side, which was eaſily ſeparable, but coherent as yet, I had not the leaſt Reaſon to ſuſpect this to be a Fracture owing its Cauſe to any Violence, but that it muſt be a peculiar Fiſſure.

Neither is this Diviſion in both theſe Bones deſtitute alſo of its Uſe, ſince it contributes not a little to the facilitating of the Birth; for by the Intervention of this Suture, the Sides of the *Maxillæ*, which by the Depreſſion of the Chin inwards muſt needs ſtand forward, admit of a more prompt Inflection inwardly, which muſt needs prove of no ſmall Advantage for the eaſier Paſſage of the Head in the Birth. And perhaps I ſhould not be much out in my Gueſs, if I did affirm, That thoſe Children which have flat Faces and Chins, have theſe Bones divided by ſeveral of theſe Fiſſures. The Reaſon why this Suture has not been obſerv'd by other Anatomiſts, muſt be doubtleſs becauſe they have ſeldom extended their Scrutinies to the Bones of young Infants, and much ſeldomer given themſelves the Trouble and taken the Pains of cleanſing theſe Bones.

'Tis now Time we ſhould alſo take a View of the Rudiments of the *Teeth* in both the *Maxillæ*. Concerning the *Mucus* out of which the Teeth are generated, as alſo concerning the Time and Manner of their Production and Eruption, many Things have been ſaid by the Anatomical Authors, which we ſhall not inſiſt upon at this Time, having confined our ſelves in this preſent Tract to what is diſcoverable only in the Skeleton of a young Infant, yet ſo, as not to omit any Thing that may tend to the illuſtrating of the Nature of the Teeth, as far as it may be gathered from their Firſt Rudiments, and from the *Alveoli* of the *Maxillæ*. And Experience teaches us, That there are extant in young and even new-born Children, (not to ſpeak here of the *Fœtus*) certain Rudiments of the Teeth: But it is to be remember'd nevertheleſs, That they are only Rudiments and Fragments, but not entire, perfect, and ſolid Teeth.

For whatever may be diſcover'd here to be bony, or to approach to an oſſeous Nature in young Children, may be look'd upon as Rudiments of the Teeth, being nothing elſe than the imperfect *Baſis* (as it is commonly call'd) of the Tooth, which afterwards in adult Perſons breaks forth and ſtands out above the *Alveoli*, or Sockets. And this *Baſis* has in different Teeth a different Degree of its oſſeous Subſtance: For in the Teeth call'd the *Inciſores* it is pretty ſolid and hard, becauſe they conſiſt of Two oſſeous *Laminæ*, or *Squammulæ*, (the interior of which is broad and ſmooth, but the exterior broad before, but curvated on the Sides) which come cloſe to one another above and on the Sides, but are ſomewhat aſunder below, and form a Cavity not unlike to what we ſee in the Honycomb. In the Teeth call'd the *Canini*, theſe Lamels are leſs and not ſo ſolid, and not ſo far diſtant from one another, but preſs'd cloſer together. In the Teeth call'd the *Molares*, this *Baſis* is a *Squammula* almoſt as thin as Paper, the Surface of which is four-ſquare, but has ſeveral ſmall Cavities; and downward towards the Body or Roots it has no Lamels, and

and ſcarce any Thing that is oſſeous, excepting ſome very ſmall Fragments ſomething like a Bone.

Neither is this Imperfection of the Teeth conſpicuous only in reference to their Subſtance and Conformation, but alſo in their Number; for in young Infants you meet not with their full Number of Teeth, as you do in Adults, but with leſs: For in each of the *Maxillæ* you ſee moſt commonly no more than Ten, and ſeldom more than Twelve Rudiments of the Teeth, to wit, Four of the *Inciſores*, Two of the *Canini*, and Four or Six of the *Molares*. Theſe Rudiments, or rather imperfect Teeth, are ſeated in the Circumference of both the *Maxillæ*, within certain Cavities implanted there, and divided by a thin but pretty deep Partition; being deſign'd for as many Receptacles to the *Baſis* of the Teeth, and the mucous Rudiments of their Roots. This Imperfection of the Teeth is no Detriment to the young Infants, and of no ſmall Advantage to the Mothers. 'Tis no Detriment to the Children, becauſe they do not ſtand in need of them for the Comminution of any ſolid Food, becauſe they are not, or ought not to be given to them; or at leaſt if they are, they may be eaſily chew'd a little beforehand. But it is of no ſmall Advantage to the Mothers; for theſe need not now ſtand in fear of having their Nipples hurt and torn by the pointed Edges of the infantile Teeth, whilſt they are giving them ſuck: To prevent which, provident Nature has thought fit to place this ſoft Fence of the Gums round the *Maxillæ* of Infants, that ſo both the Mother and the Child might perform this Part with leſs Trouble, and more Satisfaction.

CHAP. IV.

Of the Bones of the whole Trunk *of the Body.*

NExt to the Bones of the Head we muſt give you an Account alſo of thoſe belonging to the Trunk. Among theſe, the *Os Ypſiloides* ſeems to challenge a Place: But conſidering that it is not to be ſeen even among the Bones that make up the perfect Skeleton of an adult Perſon, though it has in them obtained its oſſeous Subſtance, we may doubtleſs exclude it alſo from this Skeletology of an Infant; more eſpecially ſince not only the *Baſis* and main Part of this Bone, immediately after the Birth, retains a cartilaginous Softneſs, but alſo its Sides remain for ſome time abſolutely cartilaginous. And ſo we will proceed to the *Spine*, the main Supporter or Foundation-Pillar of the whole Trunk.

Under the Name of the *Spine* we do not comprehend here the *Compages* of theſe *Vertebræ* only, which are plac'd betwixt the Head and the *Os Sacrum*, but alſo include within the Compaſs of theſe moveable *Vertebræ* alſo the *Os Sacrum*, in which we follow the Footſteps not only of *Galen*, (*de Oſſib. c. 6.*) and of ſome other noted Anatomiſts, but alſo of *Hippocrates* himſelf, (*Lib. de Artic.*) who begins his Deſcription of the Parts belonging to the *Spine* from the *Os Sacrum*. Beſides that, in young Infants the *Vertebræ* of the *Os Sacrum* are alſo divided and ſeparated from each other.

In the Structure of this infantile Spine we muſt obſerve in the firſt Place, as to its Figure, that it is not in its Length ſtreight and bent as in adult Perſons, but it is altogether curvated outwards. This Incurvation of the Spine in its Length in young Children is owing to their Poſition in the Womb, where the *Fœtus* being encloſed in ſo narrow a Place, its Body is conglobated within it ſelf, which muſt of Neceſſity produce ſuch an Incurvation; which as it ceaſes in Adults, as they begin to walk upright, and turns ſtreight, ſo it cannot but continue for ſome Time, whilſt the Child is yet very young.

There

There is another Difference obſervable in theſe *Vertebræ* of young Infants from thoſe of adult Perſons, That they are not provided with the ſpinous Proceſſes, which would be jetting outwards, but are now very ſmooth. Neither is this Abſence of theſe ſpinous Proceſſes without its peculiar Uſe, for it takes away all Danger of the *Involucra* of the *Fœtus* or the Womb, or of ſome other Parts, being impaired or hurt by them; which otherwiſe by their pointed Prominencies might prove very injurious to the conglobated *Fœtus*, either whilſt it is in the Womb, by any violent Compreſſion or Attrition, or elſe in its Paſſage out of it. But now every Thing is ſmooth near that Part where the *Fœtus* has its Poſition, or its Paſſage, nothing is to be feared from theſe *Spinæ*.

However, in that Place where theſe Proceſſes ariſe in adult Perſons, there is to be obſerved in young Infants a certain Diviſion, which owes its Origin partly to the Defect of theſe Proceſſes, partly to the Diſtance there is (more or leſs) betwixt the ſquammiform Lamels, which make the lateral and poſterior Parts of the *Vertebræ*, and which is fill'd up by the Cartilage which is plac'd betwixt the ſeveral Parts of the *Vertebræ*.

Neither are the *Vertebræ* deſtitute only of the ſpinous Proceſſes, but alſo of the lateral Protuberancies of the tranſverſe Proceſſes, which as in adult Perſons they are in the Neck perforated by the Veſſels that paſs by that Way, and in the Loins, ſtrengthen the large Trunks of the Veſſels on the back Part; ſo in new-born Children they have neither any Prominencies, not any Perforations, unleſs it be the Firſt *Vertebra* of the Neck, which does indeed ſend forth a tranſverſe Proceſs; but its *Foramen* is not entire, the anterior Part of its Circle being cloſed up by a Cartilage: For Nature not ſtanding as yet in need of theſe Fences for the Paſſage of the Veſſels through theſe *Foramina*, and through the *Coſtulæ* of theſe Proceſſes, in young Children, has not thought fit to attempt their Delineation, and to bring them to their Solidity, till in a ſomewhat more advanced Age. But the Firſt *Vertebra* of the Neck could not be without its *Foramen*, leſt the Veſſels which paſs that Way up to the Head might, by the inſtable Motion and various Jactation of the Head, be ſubject to Compreſſion, Contorſion, and Attrition, whereby the free Courſe of the Blood would be interrupted.

But though the *Vertebræ* have this Defect and Imperfection, they are nevertheleſs not deſtitute of the oblique *Apophyſes*: For though theſe alſo want much of their Perfection, yet they are ſuch as are ſufficient for the Articulation and mutual Connexion of the *Vertebræ*: For ſince the *Spine* could not be depriv'd of this Articulation of the *Vertebræ*, it was requiſite it ſhould be provided with theſe Proceſſes at leaſt: And in lieu of theſe defective and imperfect Proceſſes, the *Vertebræ* are provided with ſome Superadditions of thoſe Parts which conſtitute them; for the infantile *Vertebræ* do not conſiſt of one continued Bone, as they do in Adults, nay, not even the *Vertebræ* of the *Os Sacrum*; but the *Spondyli* of the whole *Spine*, properly ſo call'd, and even of the *Os Sacrum*, in all Twenty ſeven, (at leaſt it is ſo in our Skeleton) are compos'd of Three diſtinct Parts: The Firſt and anterior whereof, being thick and roundiſh, uſed to be call'd the *Body*; but the Second and Third are join'd partly with the *Body*, partly with one another, by an intermedious Cartilage, out of which do ariſe in Adults all, but in young Infants the oblique Proceſſes only, and form the *Latera*, and the Circumference of the *Foramen* which gives Paſſage to the Spinal Marrow in its Deſcent. And thus all the *Vertebræ* that are ſeated betwixt the Second *Vertebra* of the Neck and the *Os Coccygis* are diſtinguiſh'd into Three Parts; except the Two ſuperior *Vertebræ* of the Neck, which as they are ſtill different from all the reſt, ſo they are alſo betwixt one another. The Firſt has fewer, and the Second conſiſts of more Parts: For the Firſt *Vertebra* of the Neck, which has no ſuch thick and round Body, even in Adults, is quite deſtitute of it in moſt young Infants, and more particularly in ours: But inſtead of that thin Body (if ſo it may be call'd) that is to be obſerved here in adult Perſons, this has only a Cartilage, which extends from one lateral Bone to the other, in the fore Part, near the *Dens* of the Second *Vertebra*.

Fallopius

Fallopius tells us, (*in Obſerv. Anat.*) He has ſeen it to conſiſt of Five Parts in ſome young Infants, which being born before their Time, died immediately after; but that in others he had obſerved no more than Three. The Five Parts he makes out thus: The Firſt was that Part which being placed on the fore Part inſtead of the Body, is tied to the *Dens*. The Second and Third were the lateral Parts, in which were both the inferior and ſuperior *Sinus's*. The Fourth and Fifth were thoſe which made up the whole remaining Part of the *Foramen*.

Coiterus and *Riolan* make mention alſo of this Obſervation: But *Fallopius* himſelf affirms, That the Second and the Third were altogether cartilaginous; and therefore adds, That he had met but with Three, to wit, the Firſt, the Fourth, and the Fifth: Beſides, ſince the ſame *Fallopius* declares openly, That he could not give ſo exact an Account of it, by reaſon of its Thinneſs, as of the reſt, we may very well queſtion, whether the Second and the Third were abſolutely cartilaginous?

For Firſt, ſince the *Sinus* of the Second and Third Part ſerves for the Articulation of this *Vertebra*, as well with the Second *Vertebra* as with the Head, it ſeems as if theſe Parts ought to be oſſeous, as we obſerve it to be in all the other Articulations of the *Vertebræ*. Secondly, ſince this Firſt *Vertebræ* is not only to receive into its ſuperior *Sinus's*, but alſo to ſupport the whole Head of the young Infant, it is requiſite, in order to diſcharge this Function, that the *Sinus's*, and conſequently thoſe Parts where theſe *Sinus's* are fix'd, ſhould have an oſſeous Subſtance. Thirdly, becauſe in all the Diviſions of the infantile Bones, there remain certain Marks of them for ſome time after, 'tis not very probable, that in this young Infant they ſhould be quite obliterated immediately after its Birth, and that thoſe Parts that were diſtinct before ſhould be abſolutely united by Coalition. And it is obvious, that in the *Vertebra* of this Infant there does not appear the leaſt Sign of any Diviſion; but this Part of the Bones where the *Sinus's* are, is join'd in one ſolid Continuity with the other poſterior Part. For which Reaſon it is (beſides what has been alledged before) we are inclin'd rather to believe, That the Second and Third Parts, being join'd with the Fourth and Fifth, are only Two, and the Two only Bones which concur in the Formation of the Firſt *Vertebra*.

But the Firſt Part of this *Vertebra* was to be wholly cartilaginous for the Convenience of the *Fœtus*, which whilſt it lies conglobated in the *Uterus*, this cartilaginous Part is ſubſervient to the Flexion or Inclination of its Head forwards; which it could not have done with Eaſe, if this anterior Part had been ſolid and rigid.

The Defect which is obſervable in the Firſt *Vertebra*, Nature has thought fit to counterballance by an Addition or an Exceſs in the Second; for on the upper Part of the Body of this *Vertebra* there is to be ſeen an imperfect oſſeous *Appendix*, which afterward uniting by Coalition with the Body, is more like unto a Proceſs than an *Appendix*, and is commonly call'd the *Dentiform* Proceſs. Neither is this Separation of the *Dens* from the Body of the *Vertebra* ſupervacaneous here; for thereby it is render'd capable of receding inwardly when the Head bends forward. And as for the Three-fold Diviſion of all the other *Vertebræ*, it ſeems to be uſeful, not only in reſpect of the conglobate Poſition of the *Fœtus* in the Womb, but alſo in reference to its extended Poſture in the Birth. And the ſame Pliableneſs which is dependent alſo on the Diviſions of the *Vertebræ* of the *Os Sacrum* in Infants, contributes its Share towards the facilitating of the Birth of the Child. Neither is this Uſefulneſs of the Diviſion of the *Vertebræ* confined only to thoſe of the *Thorax* and of the *Os Sacrum*, but the reſt alſo belonging to the *Neck* and to the *Loins* have their Diviſions, which are deſign'd for ſome Uſes: For in theſe and in all the reſt, the ſoft Cartilages, which are plac'd either betwixt or about the Parts that are thus divided, afford a much eaſier Paſſage to the ſoft and almoſt fluid Nerves, through the ſpacious and pliable *Sinus's* of the Proceſſes, or rather of the *Vertebræ*. This Diviſion of the Bones of the *Vertebræ* ſeems to be deſign'd alſo for this End, to wit, that when in the Incurvation of the *Spina*, the rotund Bodies of the *Vertebræ* (ſtrictly ſo call'd) are preſs'd gently towards the *Foramina* of the *Spinalis Medulla*,

Medulla, they may be able at the ſame time to drive gently outwards the lateral Parts, and nevertheleſs leave a ſufficient Space for the ſoft and almoſt fluid *Medulla*. In adult Perſons there adhere to the *Os Sacrum* ſome few ſmall *Vertebræ*, unto which they have given the Name of the *Os Coccygis*; but this whole *Appendicula* being cartilaginous in new-born Infants, this ſeems to have no Relation to their Oſteology, which now will lead us in the next Place to the Conſideration of the Ribs.

There is no very remarkable Difference betwixt the Ribs of Infants and thoſe of adult Perſons, excepting in their Magnitude. However, their ſmall Heads or Extremities, where they are join'd with the *Vertebræ*, are almoſt cartilaginous immediately after the Birth of the Infant; though 'tis not long before they acquire a Solidity. Beſides this, we may alſo obſerve in the Frame of all the Ribs taken together, a certain Inclination towards the inferior Parts, which owes its Origin to the Globe-like Situation of the *Fœtus* in the *Uterus*, and to its Egreſs out of it with the Head forward: For in its Situation, the Head and the ſuperior Part of the *Spina* are bent forwards and inwards, whilſt the Feet and the *Os Innominatum*, as alſo the *Sacrum*, riſe as it were upwards; and in its Egreſs, the Ribs are in the ſtreight Paſſage of the *Sinus Muliebris* preſs'd downwards, and ſo muſt needs acquire this pendulous Depreſſion, by reaſon of their ſlight and laxe Coheſion with the *Sternum* and the *Vertebra*: And this very Depreſſion ſerves to facilitate the Extruſion of the Child in the Birth.

The Ribs are join'd together before by the intermediate *Sternum*, and its lateral Cartilages. Concerning the *Sternum*, its Bones, and their Number, as alſo of their Coalition, and the Difference there is obſerved in them according to the Difference of the Age, Strength, *&c.* the Anatomiſts have ſufficiently tormented themſelves and their Readers; for one is for augmenting another for diminiſhing their Number: One ſays theſe Bones are united and grow together at ſuch a Time, another ſays at ſuch a Time. It is this that has induced us at this time rather to ſay nothing concerning the Number and Union of theſe Bones, than to pretend to diſprove what others relate upon the Experience and Credit of their own Eyes and Hands: The more, ſince the *Sternum* of our infantile Skeleton is compoſed of one continued Cartilage, which emits its lateral Cartilages to the Extremities of the Ribs. There is indeed ſome Appearance, about that Part or Interval which is betwixt the Cartilage of the Third and Fourth Ribs, a little towards the left Side of the *Sternum*, of a white round *Punctum*, which is harder than a Cartilage, riſing a little both above the interior as well as the exterior Superficies: But I will not be poſitive in affirming it to be a true Bone, no more than that which being obſervable in the Middle of the uppermoſt Part of the *Sternum*, is very like unto the former, excepting in its Colour, which is ſomewhat darker; unleſs you will have theſe *Punctula* to be the Centers, as they are call'd by ſome, which give Riſe to the other oſſeous Parts, and expand themſelves to their Circumferences. The Uſes of theſe anterior Cartilages of the Breaſt-Bone are to facilitate the globular Poſition of the *Fœtus* in the Womb, and the Birth, by giving Way by their Pliableneſs to the Compreſſion of the Ribs of the Infant in Parturition: And laſtly, to promote Reſpiration in the Infant ſo ſoon as it is born.

With the ſuperior Part of the *Sternum* are join'd the Two *Claviculæ*, which beginning at its *Latera*, extend themſelves on the Outſide in the Shape of a long *ſ* towards the Head of the *Humerus* and the *Acromion* of the *Scapula*. Theſe Clavicles have (*cæteris paribus*) the ſame oſſeous Solidity and Figure as in Adults. Whence it is, that the *Claviculæ* are not ſo much as mentioned by ſome Anatomiſts in the Accounts they give us of the Infantile Bones. But ſince even the moſt imperfect Bones belong to the Complement of an Infantile Skeleton, it would look like an Overſight in us ſo far to neglect the moſt perfect Ones, as not at leaſt to mention them, and to alledge ſome Reaſons why there was not the leaſt Neceſſity for their being imperfect, but that on the contrary this Perfection is of ſingular Uſe and Benefit to the *Fœtus*: For if the *Claviculæ* had been even more ſolid than actually they are, it would not have proved in the leaſt incommodious or detrimental to the Child, either in refe-

rence to its Poſition in the Womb, or in reſpect to its Egreſs out of it; ſince by the Flexibility of thoſe Parts unto which they are join'd, they are capable of accommodating themſelves to any Preſſure or Compreſſion. But on the other Hand, being of a rigid Subſtance, they ſupport both the *Scapulæ* and the *Humeri*, leſt they ſhould either by their Conglobation in the Womb, or by a Compreſſion in the Birth, ſuffer a vitious Contorſion in their Figure, which ſeems to be prevented in a great Meaſure by the Solidity of theſe Bones.

In young Infants, the Two *Scapulæ*, like Two broad Shields, are plac'd on the back Part of the ſuperior Ribs; ſo that theſe Two Bones even in new-born Children are arrived almoſt to their full Perfection: For the *Scapula* does expand it ſelf here into a broad Table, and riſing by degrees, produces the *Spina*, and at laſt, towards the *Humerus*, its *Neck*, which is very ſtreight. But theſe *Scapulæ* are not without their Imperfections, being deſtitute of ſeveral Proceſſes and Appendages; or at leaſt thoſe they have are cartilaginous, eſpecially at the *Baſis*, for ſome Space along the *Dorſum* and along the *Spina*, as alſo at the very Extremity of the *Spina*, from whence ariſes the *Acromium*, which is here incruſtated with a thin Cartilage. *Riolan* alſo makes the Neck of the *Scapulæ* cartilaginous; and *Coiterus* the greateſt Part of the Neck, to wit, the *Acetabulum* of the *Humerus*, together with the Proceſs *Ancyroides*. But ſince in our Skeleton the ſuperficial *Sinus* of the Neck of the *Scapula* is very ſmooth and bright, and the Cartilage *Glenoides* ſeems to diſcover ſomething of an *oſſeous* Subſtance by its Whiteneſs, (becauſe moſt commonly there is to be obſerved ſomething of a corrugated Roughneſs, inclining to Black, in the *Sinus's* of the cartilaginous Articulations) it appears to me more probable, That neither the whole Neck, nor the greateſt Part of it, is cartilaginous, but that it conſiſts of a ſhort obtuſe Bone, which, as the Child encreaſes in Years, is extended into a longer Proceſs. But though we allow the Neck to be of an oſſeous Subſtance, we do not for that Reaſon grant the ſame Prerogative to the *Proceſſus Coracoides*, which hitherto does not ſhew us its crooked Beak ariſing out of this Neck. It was but requiſite, that young Infants ſhould be provided with the *Scapulæ* form'd in that Manner and Condition as we ſee them, to wit, ſuch as might be a ſufficient Fence to the Ribs, and the hindmoſt Part of the Cheſt, and a Support to the *Humerus*; and might, beſides this, be adapted to facilitate the Compreſſion of the Body of the young Infant. The Smoothneſs and Breadth of the Table of the *Scapula* was adapted to make ſuch a Fence, as the *Sinus* of its ſhort Neck, and the Prominency of the Spine forward, were fitted for its Support; and the Defect of the *Proceſſus Ancyroides*, together with the Shortneſs of the Neck, were ſufficient for the facilitating the Compreſſion.

There is nothing left now belonging to the Trunk of our Skeleton but the *Oſſa Innominata*, which as they vary in young Infants from thoſe of adult Perſons, ſo it will be very well worth our Enquiry into the Structure of their Parts, and their peculiar Denominations. Theſe Two Bones therefore do not conſiſt of One continued Body, as they do in adult Perſons, but of Three diſtinct Parts, ſeparated by a moſt manifeſt cartilaginous Interval. Among theſe, the ſuperior and poſterior Part is join'd with the *Vertebræ* of the *Os Sacrum* by intermediate Cartilages, from whence it aſcends upwards with its ſemilunar cartilaginous Edge and Circumference, and extending it ſelf forward to the Middle of the Cavity of the *Acetabulum*, and laſtly being below annexed to the Brink of the *Foramen Magnum*, forms the *Os Ilium*, properly ſo call'd. The Second, which ariſes from the anterior Part of the *Os Ilium*, and the ſuperior Cartilage of the *Acetabulum*, extends it ſelf to the cartilaginous Connexion on the upper Part with a ſhort but pretty thick Body; and is call'd the *Os Pubis*. The Third Part enters and forms the other Half of the *Acetabulum*; and from thence deſcending obliquely with its broad and thickiſh Body, ſurrounds, in Conjunction with the ſuperior Bone of the *Pubes* and the anterior Cartilage, the *Foramen* of the *oſſeous Pelvis*, and is call'd the *Os Coxendicis*, or *Iſchii*: And the Conformation of theſe Three Parts is the ſame on both Sides. It ſeem'd to be abſolutely requiſite, that this *Os Innominatum* ſhould be thus divided, and the Intervals of its divided Bones be thus fill'd up by the intermediate Cartilages:

tilages: For by this Means, in the globular Poſition of the *Fœtus* in the Womb, the *Oſſa Ilium* are not only enabled to give way outwardly to the Compreſſion of the *Viſcera* of the Belly, and the *Oſſa Pubis* being preſs'd lightly inwards, to make room for the Thighs, as they are bent upwards towards the Head; but alſo in the very Time of Parturition, by the Contraction of the Prominencies of the *Oſſa Ilium* inwards, the tender Body of the Infant is render'd more ſtreight and equal, and conſequently its Delivery is much facilitated: All which could not be done with the ſame Eaſe both to the Mother and to the Child; nay, not without much more Difficulty on either Side, if this whole Frame of the *Os Innominatum* did conſiſt of One rigid Bone.

CHAP. V.

Of the Bones of the Limbs.

TO begin with thoſe of the upper Limbs, the *Oſſa Humeri* ſeem among theſe to challenge the Firſt Place; which beginning at the Articulation of the *Humerus*, (properly ſo call'd) extend to the Flexure of the *Cubitus*. Theſe *Oſſa Humeri*, in reference to the principal Part of their Body, differ very little, or ſcarce any thing at all, from the Bones of adult Perſons; but in both their Extremities there appears a very remarkable Difference from them; for not only the Heads of the *Os Humeri*, but alſo their *Trochleares Appendices*, which are encloſed by the Extremities of the *Cubitus*, are altogether of a cartilaginous Subſtance. In the lower Extremity of theſe Bones there lies hidden a bony Subſtance; but they do not ſend forth any *Condyli*, adjacent both internally and externally, to the *Trochleæ*: Nay, even in the middle of the hidden Extremities, among the poſterior Cavities, which receive the *Olecranum* of the *Cubitus*, the ſuperior Ones appear only; for there are not the leaſt Signs or Footſteps as yet of any *Sinus's* in the anterior and interior Parts, into which elſe the anterior *Corone* of the *Cubitus* could inſert it ſelf.

In the Extremities of the *Oſſa Cubiti* there are, inſtead of the oſſeous *Epiphyſes*, nothing to be ſeen but Cartilages: The ſuperior and longeſt of which is in lieu of the oſſeous *Olecranum* in adult Perſons; but is not extant in Infants: Neither does it ſend forth its poſterior *Corone*. But the anterior *Corone* of the *Cubitus* ariſes out of the Bone it ſelf; from whence, by a deep Deſcent, the Cavity cammonly call'd *Sigmoides* takes its Riſe; within which the cartilaginous *Trochlæa* lies concealed. But the inferior Cartilage of the *Cubitus* does not diſcover the leaſt Sign or Appearance of the *Proceſſus Styloïdes*, or of any others, which elſe have their Share in the Articulation of the *Carpus* with the *Cubitus*.

In the *Radius* there appears ſcarce any Thing in this Skeleton that is worth taking peculiar Notice of, or much differing from thoſe of adult Perſons, excepting its cartilaginous Extremities.

The Eight Bones of the *Carpus* are altogether cartilaginous in young Infants: But whether all theſe Bones conſiſt only of one ſingle Cartilage, as *Coiterus*, and after him *Riolan*, will have it, or whether the whole *Carpus* is compoſed of diſtinct Cartilages, we will not be very ſollicitous to determine. However, the laſt of theſe Two Opinions ſeems to me moſt probable, becauſe in theſe ſoft Cartilages, before they are much handled or ſqueezed together, there ſeem to appear ſome Tracts of a ſmall Diviſion; and even after they are dried, there appears in theſe Cartilages of the *Carpus* a certain Tranſparency in certain different Places, which ſeems to intimate the Diſtinctions betwixt theſe Cartilages: But our Skeleton being too dry and harden'd, theſe Diviſions are obliterated in them.

Laſtly, all the Bones of the *Metacarpus*, as well as of the Fingers, which in Adults have on their Extremities their *Condyli*, for the Conveniency of Articulation, are in young Infants provided only with cartilaginous Extremities.

Among the inferior Limbs, the *Oſſa Femoris* challenge the Firſt Place. Theſe, tho' they have an oſſeous Body of a conſiderable Bigneſs, nevertheleſs they are deſtitute on their ſuperior Extremity of the round Head, or the Two *Trochanters*, which are obſervable in perfect Bones; but in lieu of theſe Bones, are provided with cartilaginous *Appendages*. In the ſame Manner, at the inferior Extremity of the *Oſſa Femorum*, there appear no oſſeous *Condyli*, neither externally nor internally, neither any Cavity betwixt them, for the Reception of the *Apophyſes* of the Leg; for all theſe which are conſpicuous in adult Perſons, are nothing elſe but cartilaginous Rudiments here. The *Patella* alſo, which is plac'd juſt before, to ſtrengthen the Articulation of the *Femur* with the Leg, is not oſſeous, but cartilaginous. The Bones of the *Tibia* and of the *Fibula*, though they are ſolid in their Bodies, yet their Appendages both on the inferior and ſuperior Extremities, are not bony, but cartilaginous.

In adult Perſons the *Tarſus* conſiſts of Seven Bones; but in young Infants theſe are for the greateſt Part, if not alogether, cartilaginous, and ſhew their Diviſions by ſome ſlight ſuperficial Tracts. And even in new-born Infants you may obſerve ſometimes One or Two, or perhaps more, Rudiments of theſe Bones. Here in our Skeleton the *Oſſa Aſtralagi*, as well as the *Oſſa Calcanei*, begin to be pretty ſolid, yet are ſtill inveſted with abundance of a cartilaginous Subſtance; but the Two *Oſſa Cymbiformia*, the Two *Cubiformia*, and the Three *Cuneiformia*, ſtill retain their cartilaginous Flexibility. Concerning the *Oſſa* of the *Metatarſus* and of the Toes, what has been ſaid before of the Bones of the *Metacarpus* and of the Fingers, muſt be applied to them here, to wit, that their Extremities which ſerve for their Articulations are cartilaginous. Neither is there any Thing worth our peculiar Obſervation in this our Skeleton, in relation to the *Oſſa Seſamoidea*, as well of the Hands as of the Feet, excepting that they are all of a cartilaginous Subſtance, which continues, at leaſt in moſt Infants, for ſome Time after the Birth.

The Bones of the Limbs were doubtleſs provided with theſe cartilaginous Extremities, and Conformation of their Parts, for no other End than that the *Fœtus* might with the more Eaſe keep its conglobated Poſition in the Womb, and afterward ſuffer the Compreſſion of its Parts in its Egreſs from thence with more Facility: For if the Extremities of the Bones of the Limbs had been oſſeous and ſolid, it muſt needs have proved incommodious both to the *Fœtus* and the Mother, eſpecially towards the latter End of her Child-bearing, when the infantile Limbs and their Bones begin to move a little, and as it were extend themſelves, and conſequently make a Preſſure upon ſome other Parts: But now being provided with cartilaginous Extremities, they no not preſs with any Violence either upon their own Parts, or upon the Mother's Womb, or the adjacent *Viſcera*. Neither did the young Infant ſtand in need of any oſſeous Extremities of the Bones of the Limbs, ſince it had not the leaſt Occaſion for any ſtrong Motion, which required the Solidity of its Articulations. There ſeems to be a peculiar Reaſon for that hard and ſolid Subſtance which is obſervable in the *Oſſa Aſtralagi* and *Calcanei*, to wit, as far as they are ſubſervient to make the Child to walk or ſtand more upright, they being as it were the *Baſis* of the *Tibia*, plac'd one under the other.

'Tis further to be obſerved, That the Bones, as they have been deſcribed here, are not always the ſame in all their Circumſtances in all young Infants, (for there is no ſmall Variety in them now and then) but that moſt commonly they are ſuch, in reſpect to their ſoft Subſtance, Diviſions, and Imperfections, eſpecially in ſuch Infants as happen to die either in the Birth or ſoon after it.

CHAP.

CHAP. VI.

Of the Preſervation of the Bones *of young Infants in their natural Conſtitution, and their Cures in a preternatural State; divided into Five ſeveral Heads.*

NExt to the Cognition of the Nature and Structure of the infantile Boxes, it is requiſite we ſhould ſay ſomething alſo concerning their Preſervation in their natural Conſtitution and Conformation, as likewiſe by what Means their vitious Diſpoſition may be altered, and they reduced to their natural State and Condition.

And here I would have no Body propoſe to himſelf, to meet in this Tract with a compleat Account of the Manner of the Conception of the *Fœtus*, or how the ſame is to be managed during the Time of *Geſtation* and *Parturition*, much leſs how the Child is to be taken Care of afterward in its Education, *&c.* our preſent Intention being to confine our Directions and Method to the natural and due Structure and Figure of the infantile Bones, and to illuſtrate theſe Rules with ſuch Inſtances and Reaſons, as may not only ſerve as a Direction to Midwives, Chirurgeons, and Phyſicians, how to manage the Bones of young Infants in caſe of a vitious Conformation, but alſo to Parents, how to act their Part, in endeavouring as far as in them lies to bring into the World well-ſhap'd Children, and to avoid every thing that may impair and vitiate the natural and tender Diſpoſition of the infantile Bones, either in the Womb, or after they are born.

And upon this Occaſion I could enter upon an ample Theme, in relation to the Coition, Conception, the Capacity of the Womb, and its adjacent Parts, and their natural as well as preternatural Diſpoſition; as alſo concerning the ſtupendious Effects of Imagination in Child-bearing Women, and ſome other ſudden and extraordinary Caſualties. I ſay, I could enlarge my ſelf upon all theſe Things as far as they have a Reſpect to the regular or irregular Conformation of the *Fœtus*: But as theſe Things affect not only the Bones, but other Parts alſo, and we have limited our preſent Deſign to the infantile Bones only, we think it ſuperfluous to inſiſt upon them at this Time.

I. *Child-bearing Women ought to allow a full Diſtention to the Womb, and take great Care not to ſtreighten it, or ſuffer it to be ſtreightned in any manner or Way.*

Among other Reaſons why the *Abdomen*, or inferior Region of the Body, has obtain'd a pliable carneous Subſtance, without any Bones, this ſeems to be none of the leaſt, to wit, That by the Flexibility of the carneous and membranous Parts, it might be the eaſier expanded in Women, and conſequently its Cavity, as the *Fœtus* encreaſes in Bulk in the Womb, be dilated without any Inconveniency to the Mother. If therefore a Woman finds her ſelf with Child, ſhe ought to give full Liberty to the Womb and the *Abdomen*, that they may diſtend themſelves without any Obſtacle, in order to promote as far as in her lies the Growth, Poſition, and juſt Conformation, of the Parts of the *Fœtus*, but eſpecially of its Bones: For if the Mother, either by Neglect or deſignedly, ſtreightens the Capacity of the *Abdomen*, and conſequently of the Womb, it may eaſily happen, that the flexible Bones of the *Embryo* are diſtorted, the Articulations diſlocated, and other very dangerous Accidents and Misfortunes befal the *Fœtus*. And it is very probable, That moſt of theſe vitious Conformations of the Bones that are obſervable in new-born Babes, are con-

contracted in the Mother's Womb, and owing to the irregular and exceſſive Compreſſion of the *Abdomen* and the Womb: For it ſeems not rational, that all the Mothers that bring ſuch miſhaped Children into the World, ſhould be affected with a preternatural Anguſtation of the Womb, (with *Scirrhous* Tumors of the adjacent Parts, or any other internal Diſeaſes; or that they ſhould have been expoſed to ſudden Frights, or any external Violences, ſuch as Blows, Falls, *&c.* or that they ſhould be diſcompoſed to ſo high a Degree by an irregular Imagination or Appetite. This, I ſay, does not ſeem agreeable to Truth, but rather that moſt, if not all thoſe moſt miſerable Objects and Spectacles we obſerve daily, of lame, diſtorted and luxated Limbs, owe their Origine to the Compreſſion of the Womb.

For what is more common, than to ſee young married Women to be ſo fond of being accounted well-ſhaped, as to ſqueeze in their Bellies, after they are with Child, into ſuch ſtraight and long-waſted Stays, as muſt needs prove detrimental to the true Poſition of the Limbs of the *Fœtus* in the Womb: Such being the Pride of ſome Women, that they have much more Regard to the Nicety of their Apparel, than to the well-being of the Infant.

Neither is the *Fœtus* in the Womb expoſed to leſs Danger from the Mother's leading too ſedentary a Life, from her ſitting conſtantly upon a very low Chair, and inclining her Breaſt forward: For by this Means, Women that are either obliged to get their Living by a ſedentary Employment, or are addicted to much Reading, by the Flexion of their Bodies, and the Compreſſion and Contraction of the *Abdomen*, and the Womb, too often bring contorted and miſhaped Children into the World. *Paræus* (*Oper. Chir. l.* 25. *c.* 11.) adds to this, When big-bellied Women ſit croſs-legged, with their Knees aſunder, like the Taylors; and gives us an Inſtance, and the Figure of a Child whoſe Hands and Feet were quite diſtorted outwards, becauſe the Mother uſed frequently to ſit and work in that Poſture: Which ſeems to be very rational; for when the *Abdomen* is very big, and at the ſame Time kept cloſe betwixt the incurvated Breaſt, and the Legs, it muſt of Neceſſity ſuffer a Compreſſion and Anguſtation, as well as the Womb, which is incloſed within its Cavity, and conſequently communicate the Effects thereof; to wit, Contortions, and Luxations to the *Fœtus*.

The very Acts of Coition betwixt Man and Wife, do produce alſo ſometimes very doleful Effects in the tender *Fœtus*: As for Inſtance, When during the Venereal Congreſs they embrace and graſp one another too cloſely; or when the Husband by his Weight lies too heavy, or preſſes too hard upon the Woman's Belly; or when ſhe, perhaps to indulge her own laſcivious Pleaſures, twiſts her ſelf too cloſe about her Husband's Body whilſt he is lying upon her. For, by theſe irregular and violent Acts of Venery, the *Abdomen* of the big-bellied Woman ſuffers a moſt vehement Compreſſion and Concuſſion, and conſequently the Womb within the *Abdomen*, and the *Fœtus* within the Womb, which too frequently produces an ill Conformation of the ſoft Bones, and a Diſlocation in the Joints; ſo that in caſe Parents can not, or will not, abſtain from Venery during that Time, they ought at leaſt to make Uſe of it in ſuch a Manner, and in ſuch Ways, as may not prove detrimental to the *Fœtus*.

If big-bellied Women are voracious during the Time of Geſtation, they may alſo procure an Anguſtation of the Womb; for the Stomach, being diſtended by the great Quantity of Aliments lodged within its Ventricle or Cavity, does preſs the Inteſtines downwards, and theſe make a Compreſſion upon the Womb, and the Womb upon the *Fœtus*. And tho' it it may be objected, That the Stomach may be diſtended as well upwards as downwards; and that the Inteſtines may be propelled to the Sides; and that conſequently they will not prove too weighty for a *Fœtus*, if it be ſtrong and lively: Nevertheleſs it is certain, that about the Fifth, Sixth, and Seventh Month eſpecially, the Womb may ſuffer an Anguſtation, and the *Embryo* in the Womb; and that by the exceſſive Diſtenſion of the Stomach, occaſioned by the immoderate Ingeſtion of flatulent or hard and indigeſtible Meats, which preſſes upon the Inteſtines.

A Woman that is deſirous to bring into the World a well-ſhaped Infant, muſt abſtain from all ſuch Exerciſes and Labours as may

may indanger its natural Formation in the Womb. Of this Kind are, Exceſſive Extenſions of the Body, violent Contortions and Concuſſions, and in ſhort, all violent and irregular Actions and Motions, which may prove hurtful to the tender Bones of the Infant.

Sometimes alſo this Diſtortion or Luxation of the infantile Bones, is occaſioned by certain hidden Diſtempers, either in the Womb, or Tumors in the adjacent Parts. Of this *Levinus Lemnius* gives us an Inſtance, (*l.* 4. *c.* 7. *De occult. Nat. Miraculis*) in an Infant, the Hand of which was formed like a Stump, without any Appearance of the Fingers: For all the Parts, and the whole Series and Connexion of thoſe ſmall Bones, which ſerve either for the Complication, or Expanſion of the Hand, were found to lie concealed inwardly. He makes the Hardneſs or Scirrhoſity of the Spleen, unto which the Mother of this Child was ſubject, and her lying uſually upon the Left Side, the Cauſe of this preternatural Conformation; becauſe theſe Parts of the Hands did lie upon, and hit againſt the indurated Spleen, like againſt a Rock. Thus, if the Mother be afflicted with the Stone in the Kidneys, with a *Scirrhus* in the Cavity of the Womb, or ſome Tumors in divers other circumjacent Parts, may alſo produce a vitious Conformation in the Bones and Joints of the Infant: To prevent which, the beſt Way Parents can take in ſuch like Caſes, is to crave the Advice of an underſtanding Phyſician.

Among theſe Diſtempers, ought to be numbered alſo the native Anguſtation of the Womb; for as much as it cauſes a Compreſſion upon the Bones of the *Fœtus*: But conſidering that this Anguſtation does not only affect the Bones, but alſo hinders the Growth of all the other Parts of the infantile Body, we need not inlarge any further upon that Head at this Time, but will proceed to the Second; to wit, to the Compreſſions and Detriments that may ariſe to the *Fœtus* by external Violences and Injuries.

II. *Big-bellied Women ought to be very cautious how they expoſe themſelves to Quarrels, Dangers, and all other Things which may make a violent Compreſſion and Impreſſion upon the infantile Bones.*

Tis obvious, that if big-bellied Women will intermeddle in Quarrels, it may eaſily happen that they receive ſome Blows, Contuſions, or be otherwiſe expoſed to ſome external Violences, which will produce Diſlocations and Contortions in the weak Joints and tender Bones of the Infant; eſpecially if theſe Blows or Contuſions happen to light upon the Belly of the Woman. For this Reaſon, big-bellied Women ought to avoid all Manner of Danger, and dangerous Places; eſpecially ſince there are not wanting Inſtances; When after ſome Fall or Bruiſe, the Mothers have eſcaped without any conſiderable Damage; when at the ſame Time, the *Fœtus* has received and brought into the World the direful Marks of it in its Bones. *Shenkius* relates a Hiſtory of this Kind, (in his *Obſerv. Med. l.* 5. *Obſ.* 48.) of a Woman, who falling down a Pair of Stares backwards without receiving any conſiderable Hurt, was afterwards in due Time delivered of a Female Child, which had a Luxation in the Spine of the Back, and died when ſhe was about 17 Weeks old.

But after the *Fœtus* has eſcaped all theſe Dangers in the Mother's Womb, it is then that it moſt juſtly challenges and expects the Aſſiſtance of others in its Delivery, which is to be the Subject of the Third, and the next following Head.

III. *Women, when they find the Time of their Labour to draw near, and every Thing elſe concurring towards their Delivery, ought to make it their main Endeavour to facilitate the Egreſs of the Child through its narrow Paſſage; and therefore, ſo ſoon as they obſerve the Child to be coming forth, they muſt take heed not to ſtop or ſlacken their Pains and Labour, leſt the Child's Bones ſhould ſuffer a noxious Compreſſion during the Time of its coming into the World.*

For tho' the Child has attained its regular Conformation, and is upon the Point of its Delivery, nevertheleſs if the Mother, either out of Ignorance, or becauſe ſhe is faint-hearted and impatient of the Pains, checks her Labour, and her Delivery, the tender In-

Infant, whilſt it is thus preſſed and ſtruggling in the Birth, may eaſily ſuffer ſuch a violent and long continued Compreſſion, as may vitiate the external Structure and Figure of its tender *Skull*, the pliable *Compages* of its Ribs, or of the *Humerus*, the Cubit, Legs, *&c.* Nothing is more certain, than that many Children, which naturally were very ſtrong and vigorous juſt before their Birth, and ſtrive very hard for their timely Delivery, are nevertheleſs loſt in the very Birth: For it often happens, that by a too long continued, or too violent a Compreſſion of the Skull, the ſoft Subſtance of the Brain does either quite fall, or is ſtruck together, or that, by the Anguſtation of the Breaſt, the Lungs are preſſed too cloſe upon the Heart, which is followed by a total Oppreſſion, or Suffocation; not to mention here divers other Cauſes and Accidents which prove fatal to the Infant even in the Birth.

Among others, it is not improbable, that ſometimes, when one Part of the infantile Body has already opened its Way through the narrow Paſſage of the Womb, if the Labour be check'd unfortunately at that Time, it may be quite torn off from the reſt; to wit, if the *Pudenda* happens to cloſe up about the narroweſt Part. *Henry van Heer* (*Obſerv.* 14.) relates an Inſtance of this Nature of his own Barber's Wife, who having a very hard Labour (as ſhe always uſed to have) with her Eleventh Child, becauſe the Infant (as all the reſt had done before) came with the Feet firſt, the Midwife taking hold of the Feet, (as ſhe had always done before) pull'd out the Child as far as to the Neck; but the Head not being able to follow, was left behind in the Womb.

This Diſaſter, as it doubtleſs proceeded from the Weakneſs of the Mother, who being quite tired out with her hard Labour, the Neck of her Womb did doubtleſs contract it ſelf round the Neck of the Child; ſo this ought to ſerve as a Warning to all Women in Labour, to be ſedate, patient, and couragious, at this Time of Danger, this being the beſt and moſt likely Way to ſee themſelves disburthened by a happy Delivery. On the other Hand, if the Midwife finds the Woman to become faint and unable to help her ſelf and the Child, 'tis then ſhe ought to make Uſe of all her Strength and Skill to facilitate the Eruption of the Infant; but above all, to take Care that the *Muliebria* are not contracted before their due Time.

But ſuppoſing after all, that the Woman in Labour wants neither Strength nor Courage, and that ſhe, as well as the Midwife, are not deficient in their Endeavours to facilitate the Birth; if, I ſay, after all this, the *Muliebria* are either too ſtraight or dry; if there be a *Scirrhus* in the Neck of the Womb, or the *Inteſtinum rectum* be hard and tumified by Reaſon of ſome Excrements, or of ſome flatulent or other vitious Humours; or if there be a large Stone in the Bladder; or if there be an ill Conformation in the *Os Coccygis*, or any other Obſtacles of that Nature which may render the Egreſs of the Child out of the Womb difficult; this will infallibly cauſe a violent Compreſſion of the tender Bones of the Infant: Of which we have frequent Inſtances in the Hiſtories of our Phyſicians.

But ſince many of theſe Accidents do not depend from the Care of the Mother, but from ſeveral other Cauſes; we will now proceed to give you in the next following Head, an Account of the Duty of a Midwife, and the beſt Directions we can in what Manner ſhe ought to diſcharge this Duty, in giving a helping Hand to facilitate the Birth, and keeping the Bones of the Infant in their natural Poſition.

IV. *The Midwife muſt take Care to reduce the Body or Limbs of the Infant in the Birth, (if it is coming forth the wrong Way) and to turn it into its ſtraight and natural Poſition; and if there be any vitious Conformation in the Bones, to endeavour to reſtore them to their natural Figure, by Rowling, and other gentle Means.*

Beſides the natural Poſition and Figure of the infantile Body in the Womb, and at the Time of Parturition, ſuch as has been repreſented by us before, there are divers other prepoſterous Ways, by which the poor Infant oftentimes endeavours to break forth from its Confinement.

Thus ſometimes it happens, that the Child comes with both the Feet cloſe and ſtraight forwards firſt, its Hands lying at the Hips; or with the Feet forwards alſo, with the Arms and Knees extended at the Sides; or with

with the Arms lifted upwards; or perhaps with one Foot firſt, the other being drawn backwards, with the Arms extended, ſometimes downwards on the Sides of its Body, or ſometimes ſtreight upwards to the Head. Sometimes the Child does indeed make its Appearance with the Head firſt, but ſo as to have one or both the Hands extended cloſe to it; or elſe with the Hands and Feet foremoſt at once; or with its Buttocks, its Back, or its Shoulder; but with the Arms and Legs, or the firſt at leaſt ſtanding upwards; or elſe with the Belly foremoſt, the Arms and Legs being alſo upwards. Sometimes it comes alſo with the Knees foremoſt, with its Hands cloſe down to the Hips. Sometimes there are two Twins, which come with both their Heads firſt, or with their Feet; ſometimes one of them comes with the Head, and the other with the Feet foremoſt; with many other prepoſterous Poſitions, wherein the Infant endeavours to open its Way into the World.

And in theſe Caſes it is, that the Midwife ſtands in Need of all her Skill, Prudence, and Diligence, in order to reduce either the whole Body, or elſe the Arms and Legs, to ſuch a Poſition, or to ſuch a Figure, as is either quite natural, or at leaſt approaching neareſt to the natural one. But whilſt ſhe is endeavouring this, ſhe muſt act with the utmoſt Caution; leſt, if ſhe proceed with Violence in reducing the Body and Limbs to their natural State, there ſhould happen in the tender Bones of the Infant, any Incurvations, Diſtortions, Attritions, or Fractures; or that the ſoft Additions of the principal Bones be broken aſunder, or the Heads be removed out of their *Sinus's* in the Joints, or receive any other Detriment or vitious Impreſſion. For how eaſily ſuch-like ſiniſter Accidents may befal the poor Infants, by the Ignorance or Miſmanagement of Midwives, is ſufficiently obvious by the Account we have given you of the tender Conſtitution of the infantile Body, its Limbs and its Bones.

'Tis true, there are certain Caſes ſo dangerous in this vitious Poſition of the Child in the Birth, that it is abſolutely requiſite, rather to venture the Incurvation, or Luxation of one of the Bones of the Arm, or Leg than run the Hazard of the Mother's, or the Child's Life, or perhaps of both. But as ſuch-like Caſes may ſerve oftentimes to cover the Ignorance or Neglect of the Midwives, ſo it does not juſtify them, when ſuch-like Things are done without an abſolute Neceſſity. But without inſiſting any longer upon this Matter, or pretending to give any particular Directions how Midwives ought to act in ſuch-like difficult Caſes, (it being beyond our preſent Purpoſe) we will now ſee how the Child is to be managed after its Birth.

The firſt Thing the Midwife has to do after the Child is brought into the World, in Reference to its Bones, is to take and handle it with the utmoſt Tenderneſs and Circumſpection, for Fear it ſhould touch or hit againſt any Thing that is hard, which might endanger its flexible Head, impair its Bones and Neck, produce a Luxation in the *Vertebra* of the Back, or of the Loins, or an Anguſtation in the *Thorax*, or a vitious Conformation in the Limbs.

Beſides this, there is no leſs Care to be taken in the Management of the Child, and the Figuration of its Bones, before and in the rowling it up in the Swathing-Clothes: For the ſmall infantile Bones being pliable like Wax, as they may eaſily be diſtorted by an unskilful Hand, ſo their Flexibility affords this Advantage, that their Figuration may be diſpoſed into a better Order, and amended by the Dexterity of the Midwife. 'Tis upon this Score, that the Midwife ought to view the Infant from Head to Foot, and to try and manage its Limbs and Joints with all poſſible Gentleneſs and Prudence: Then bend its Hands and Arms gently towards the Knees, and to draw the Feet on both Sides lightly forwards and backwards, and before alſo towards the Head, to endeavour to ſet or keep the whole Frame of the Spine upright, as well as the Legs ſtreight. But while they are intent upon this Work, great Care muſt be taken, leſt by over-doing the Matter, they, inſtead of giving a helping Hand to Nature, don't diſcompoſe the true Poſition of the Parts, and inſtead thereof introduce a vitious Conformation; which muſt be attributed chiefly to the Ignorance of the Midwife, who miſtaking the natural Poſition of any Part, but eſpecially of the Head or *Thorax*, for a preternatural One, whilſt

ſhe pretends to amend the Matter, occaſion a vitious Conformation and Contortion.

I ſaw not long ago a remarkable Inſtance of ſuch an Ignorance and prepoſterous Curioſity in a Miniſter's Child in the *Omelands*, the tender Head of which, by the Ignorance of the Midwife, had ſuffered ſuch a Compreſſion on the Sides, that the Extremities of the *Oſſa Syncipitis*, being forced inward at the Concourſe of the *Sutura Sagittalis*, made a very deep *Sinus*, reaching from the *Occiput* to the ſuperior Part of the *Frons*. In ſuch-like tickliſh Points as theſe they had better not to meddle at all, than to do Miſchief: For after all, it is ſufficient for a Midwife, if ſhe knows how, to extend the pliable Limbs of the Child, and to keep them in their natural Poſition, without being overofficious in adding to the Figuration of its Parts.

Nevertheleſs this does not exclude the Midwives from doing their Duty to the utmoſt, in reference eſpecially to the Rowling up of the Infant in its Swathing-Clothes: For the Exactneſs of the Firſt Modulation of the Parts after the Birth, ſeems to depend on the Rowling up of the Child; for the Body of the Infant being kept for a conſiderable Time rowl'd up in the Swathing-Clothes, they may by this Means either be reſtored to their natural Shape, or elſe be reduced to a vitious Figure: Nothing being more natural to conceive, than that the pliable and tender Bones of the Infant are very apt to accommodate themſelves to thoſe Involucres, eſpecially if they are very ſtreight, and continued ſo for any conſiderable Time. This is ſo obvious, that ſome Authors have attributed the Difference that is to be obſerved betwixt the Legs of the *Spaniards* and the *French*, to the different Method uſed by thoſe Two Nations in rowling their Infants in Swathing-Clothes: And *Hippocrates*, as well as *Galen*, *Fabricius Hildanus*, with many others, have attributed the vitious Conformations of the Bones of the Head, the *Thorax*, the *Scapulæ*, the Loins, *&c.* to the prepoſterous Ways uſed by ſome Midwives, Nurſes, and Mothers, in rowling their Children up in the Swathing-Clothes.

Since therefore there ariſe ſo many and ſuch eminent Dangers from this pliable Diſpoſition of the infantile Bones, and the Miſmanagement of them, either through Ignorance or Neglect in Rowling, I judge it may not be improper, or beyond our preſent Purpoſe, if I preſcribe ſome of the chief and moſt neceſſary Rules to be obſerved in this Point.

Above all Things, let the Head be kept as near as poſſibly can be in its natural Rotundity, ſo that it may be ſomewhat compreſs'd on both Sides, either by Nature or by Art, and have its due Prominencies both on the anterior and poſterior Part; and take Care in the Dreſſing of it in ſuch a manner, that it may not be apt to bend either forwards or backwards, or on either Side, but be kept upright, and according to the Neck and Breaſt. The Neck muſt be extended gently, and kept upright by proper Bindings; eſpecially if it be flaccid and looſe, peculiar Care muſt be taken that it may not ſuffer a Diſtortion whilſt you rowl or unrowl the Child, by lifting up the Trunk of the Body at too great a Height; for if the whole Body preſſes upon the Neck, it may eaſily happen that it does.

Concerning the Shoulders, you muſt be careful not to thruſt them up too high nor too low towards the *Thorax*, but keep them in a ſtreight Line to one another downwards, ſo that the Arms may hang extended on the Sides of the Body.

The Spine muſt be put into a ſtreight and regular Poſition. The Convexity of the *Thorax* muſt be done up in ſuch a Manner, together with the Arms and Hands, that the Cartilages of the *Sternum* may neither bend too much inwards nor outwards, nor that the flexible and ſoft Subſtance of the Ribs, and more eſpecially of the ſpurious Ribs, may not be driven ſo upon the adjacent Parts, as to occaſion an Anguſtation either of the Cavity of the Breaſt or of the *Abdomen*. At the ſame Time take heed, that the Bones of the Arms, of the Hand, and of the Fingers, do not ſuffer any Diſtortion. The Form of the *Os Innominatum*, which muſt be proportioned to the inferior *Venter*, muſt be rowl'd up thus, that it may not have too much Space given it, nor be too ſtreighten'd, as to impair the natural Capacity of the *Pelvis*. The *Oſſa Femoris* muſt be tied up in ſuch a Manner, that their uppermoſt Heads may not preſs too cloſe upon the

Cartil-

Cartilages of their *Acetabula*, nor be kept too far aſunder, nor too near to each other. Both the Knees muſt be preſs'd gently downwards, and rowl'd up together with the Legs in a ſtreight Ligature, to prevent their Incurvation. The Feet, properly ſo call'd, muſt be done up pretty cloſe together, in the ſame Poſition as if the Child was to walk or ſtand upright; ſo that there may not ariſe any vitious Diſpoſition in the natural Situation of the cartilaginous Bones of the *Tarſus*, nor of the *Metatarſus*, or in the ſeveral Ranks of the Toes.

In Reference to the Rowling up of the Parts of the infantile Body, this muſt be taken for a general Rule, That as if it be done too ſtreight, it is attended with certain unavoidable Inconveniencies; ſo if it be too looſe, they may loſe their natural Figure and Poſition. Neither muſt you be too forward in leaving off your Rowlers, or changing your Way of Rowling the Child, without ſome very good Reaſon, till the Body of the Infant has acquired ſuch a Degree of Solidity in its Bones, as may be able to ſupport the Frame of its Body without the Help of Rowling. But to pretend to preſcribe any exact Time in general, when either the whole Body, or ſome certain Parts of it, may be managed without theſe Deligations or Rowling, would be to little or no Purpoſe, conſidering the Difference there is in the Strength of the infantile Bodies: Beſides that much muſt be allowed in ſuch Caſes as theſe to Cuſtom, and the Womens own Fancies.

Thus for Inſtance; If the Child's Head be firm and ſolid, and the *Vertebræ* as well as the Muſcles of the Neck be ſufficient to ſupport the Head, the Ligatures of the Head and Neck may be left off the ſooner. And again, if you find the Arms to be pretty ſtrong in the Joints, the Child may not only be coated the ſooner, but alſo the Arms kept without rowling. *Mercatus* indeed tells us, That the Arms are not to be kept unrowl'd till after Three Months in the Summer, and Four in the Winter; but Women will not be tied to theſe exact Rules at all Times, neither do the Arms of the Child require it.

The ſame *Mercatus* alſo tells us, That they ought not to wear any Shoes till they are Nine Months old, and that then they may by degrees, and once or twice in a Day be put upon their Feet. I agree with *Mercatus* in that Part which relates to the Beginning of their Standing or Walking upon their Feet; but as to the Shoes, this depends chiefly on the Strength of the Joints of their Feet and Toes. Neither is the Providing of the Children with Shoes, and their Wearing of them, ſubject to any Danger or Inconveniency, provided they are neither too ſtreight nor hard, nor too wide alſo, but well proportioned, and fitted to their Feet: For if they be ſo, they are rather ſubſervient to the ſhaping of the Feet, and rendring the Bones the more ſolid.

But I believe I have inſiſted too long upon a Subject, which relating only to Children and Women, will be judged by ſome to be below the Conſideration and Care of Men of Learning and Underſtanding; wherefore I will, without inſiſting upon any other Matters that have a near Relation to it, ſuch as the vitious Conformations of the infantile Bones, ariſing from the prepoſterous Dreſſing and Holding of the Child, as well as from inconſiderate Motions, and violent Agitations, *&c.* come to that Head, which will ſhew us the Way how to cure or rectify theſe Diſaſters.

V. *The Bones in Infants, if reduced to a preternatural State by Depreſſions, Incurvations, Separations, Luxations, or Fractures, muſt be raiſed and reduced to their natural Poſition gradually, and not without a great deal of Precaution.*

And here a very ample Theme offers it ſelf to our Conſideration and Explication, if we were diſpoſed to enter upon the Natures, Cauſes, Signs, and Cures, of all the vitiated Diſpoſitions of the infantile Bones; ſince theſe Obſervations would lead us alſo into the Diſtempers incident to the perfect Bones: Wherefore that we may not tranſgreſs the Bounds we have preſcribed to our ſelves in this ſmall Treatiſe, we will confine our ſelves in this Part of Chirurgery relating to the infantile Bones to theſe Circumſtances that attend their Indiſpoſition, and to their Cures, and that as briefly as may be.

So ſoon as the Child is born, and the Midwife takes a View of its whole Body,

great Care muſt be taken to ſee whether or not only any of the Parts be diſtorted or incurvated, but alſo that none of the Bones may be disjointed, or any of the *Epiphyſes* ſeparated from the principal Bone; or whether there be a Solution of the Continuity: For unleſs immediate Care be taken of all ſuch-like Diſtortions, Luxations, Separations, or Fractures, they will not only prove incurable, but oftentimes alſo mortal: For theſe Relaxations of the Ligaments of the diſjointed Bones, (not to ſpeak here of Diſtortions, becauſe they are leſs dangerous) and Extenſions of the Tendons of the Muſcles, as alſo theſe Separations of the *Appendices* from the principal Bone, are infallibly attended either with an Interruption, or perhaps with a total Depravation, of their natural Functions: In the ſame Manner if the Edges of the fractur'd Bones are not ſoon re-united, there will follow an acute Pain, nay, a Contuſion and Corruption in the adjacent Parts.

It is therefore the Duty of a Midwife to look carefully after theſe Things, and if ſhe finds any Thing amiſs, to have immediate Recourſe to the Aſſiſtance of an able Chirurgeon. 'Tis true, there are certain ſlight Caſes relating to the Indiſpoſition of the infantile Bones, eſpecially if they are diſcompoſed in their Figure, which may challenge the Aſſiſtance of a Midwife. Thus if the Head be too long, or too much depreſſed on one Side, this may be amended by the Hand of a skilful Midwife. In the ſame Manner if the *Thorax*, or Breaſt, ſuffers an Anguſtation by an exceſſive Compreſſion from the *Sternum* and the Ribs, the Midwife ought upon the Spot to endeavour to reduce them to their natural Figure and Poſition. But after all, in ſuch dangerous Caſes as theſe before-mentioned, it is the beſt and ſafeſt Way, without any Delay, to crave the Advice and Aſſiſtance of an able Phyſician and Chirurgeon.

However, even among theſe there is a very remarkable Difference in reſpect to the dangerous Conſequences that attend them, as well as to their Cure. Thus for Inſtance, thoſe Accidents of the infantile Bones which have been contracted in the Mother's Womb, are the moſt difficult to be cured; as thoſe which befal the Child in its firſt Infancy are leſs difficult: For what is contracted in the Mother's Womb, has taken deeper Root, and is as it were changed into a Habit; whereas thoſe Evils that affect the Child after it is born being freſh, admit of an eaſier Cure.

But it is Time we ſhould come to the Conſideration of the particular Diſtempers of the infantile Bones. It happens ſometimes that the Bones of Infants, and among theſe, ſuch as are the broadeſt, the more convex, thin and pliable ones, ſuffer a Depreſſion inwards, without any Diviſion of either their peculiar or common Involucres, and even of the Bones themſelves: I mean ſuch Depreſſions as are obſerved moſt frequently in Silver, Braſs, and Leaden Veſſels, as alſo in Earthen Ones before they are harden'd by Burning.

This Depreſſion ſeems to belong, and is aſcribed only to the infantile Bones of the *Cranium*, and more particularly to the *Oſſa Frontis, Syncipitis, & Occipitis*: For the *Cranium* of young Infants being very tender and ſoft, and conſequently more apt to be depreſs'd than to be broken, it ſoon recedes inwards, without any Fracture, if perhaps Children happen to fall againſt any Thing that is very hard, or if their Bones are handled roughly by the Hands of an unskilful Midwife in the Birth, or if they are preſs'd againſt ſomething that is ſolid and hard in the Mother's Womb.

This Depreſſion being ſeldom attended (at leaſt not in the Beginning) with any violent Symptoms, unleſs it be with Vomiting, are beſt and ſooneſt diſcovered by the Sight and Feeling, eſpecially if there be a Tumour, occaſion'd by the Contuſion. Nevertheleſs they are not to be neglected, ſince theſe Depreſſions are an Impediment to the Motion of the Brain, which in Proceſs of Time may produce dangerous Conſequences. Beſides that, by the Violence of the Fall or the Concuſſion, not only the Subſtance of the Brain may be impaired, but more eſpecially the ſmall Veſſels that are betwixt the *Dura Mater* and the thin Membrane may be torn aſunder.

Pavius gives us a remarkable Inſtance of this Kind in a young Man of 26 Years of Age, who had only a ſlight Depreſſion (to all

all outward Appearance) in the exterior *Lamina* of the *Cranium*, and was not affected with any ill Symptoms. But happening to die within Three Months after, the *Caruncula* of the *Meditullium* were found to be lacerated; and the interior *Lamina*, as well as the ſubjacent Membrane, having contracted not only a Corruption but alſo a *Sphacelus*, this proved the Occaſion of the Death of this young Man. If this happened to an adult Perſon, What Danger muſt not be expected from ſuch-like Depreſſions in the *Cranium* of an Infant, which is not as yet ſo firm, nor defended by a double *Lamina*?

To remedy this Evil in Infants, we muſt not proceed in the ſame violent Methods as are uſed in the Skulls of adult Perſons when they are ſplit or fractur'd, but endeavour to reſtore it to its natural Poſition by much more gentle Ways and Inſtruments. For this Purpoſe *Pavius* (*Lib.* 10. *c.* 5. *Chirurg.*) orders a large Cupping-Glaſs, with a large Flame, to be applied to the affected Part, after it is cleared of the Hairs. *Pavius* adds, That the Patient ought to keep his Breath, by cloſing his Mouth and his Noſtrils. And *Hildanus* aſſures us, That by this Means he has reduced the Depreſſions in the *Cranium* of Infants to their natural Poſition. For this Purpoſe he preſcribes alſo a certain Inſtrument made of Horn, hollow within not unlike a Cupping-Glaſs, being a little crooked on the Top, and with a ſmall Hole in it. This Inſtrument muſt be applied to the depreſſed Part by Suction, which muſt be done by a ſtrong and long-breath'd Fellow, whilſt the Patient's Mouth and Noſtrils are kept very cloſe. He alſo gives us a Preſcription of a Plaiſter that will ſtick very cloſe to the affected Part, in the very Middle of it. It is compoſed of Pitch, Roſin, Colophony, and the *Gummi Elem.* and more particularly the following:

Rs. *Farinæ Tritici, unc. j. Ichthyocollæ diſſolut. in Aq. Betonic. & Salviæ, unc. ß. Pulv. Maſtich. Thur. Farin. volatilis, Sanguin. Dracon. Gypſi, ana Drachm. j. ß.* Boil all theſe Species in Water of *Betony* and *Sage* to the Conſiſtency of a Plaiſter.

This Plaiſter muſt be adapted to the Figure and Magnitude of the depreſſed Part, yet ſo as not to cover the whole Depreſſion, but only about a Third Part of it. It muſt alſo have a String faſten'd to its Middle, and thus applied hot to the Part, where the Hairs muſt not be taken off. So ſoon as you find it to be well faſten'd and dry'd on, take Care to ſtop the Mouth and Noſtrils of the Child very cloſe, and let the Chirurgeon pull off the Plaiſter at one Pull by the String, by which Means the Skin and the *Pericranium* being drawn upwards, the depreſſed Skull will follow the ſame Motion. If it does not ſucceed at the firſt time, you muſt apply a freſh Plaiſter, and proceed as before; and to allay the Pain, you may anoint the Place with the Oil of Roſes, or of the White of Eggs. But if after all, the Succeſs proves not anſwerable to your Expectation, you muſt make a cruciate Inciſion in the Skin with an Inciſion-Knife, and lift up the *Cranium* by proper Inſturments.

But I much queſtion, whether this Inciſion and Elevation may prove ſucceſsful in the infantile Skulls, which, by reaſon of its ſoft and ſlender Subſtance, will ſcarce admit of any, even the leaſt Perforation; and therefore if any ſuch Operation is to be undertaken, I judge it may be done without any Terebration; to wit, I would have a very tenacious Plaiſter, ſuch a one as has been preſcribed juſt now, applied to the depreſſed Place, in order to raiſe it by Attraction: To promote which, I would at the ſame time order a certain circular broad Inſtrument to be applied cloſe to the Circumference of the depreſſed Part, and have that Protuberancy preſs'd down gradually and gently all round about; by which Means we might promiſe our ſelves a probable good Succeſs from this Operation.

But after all, the Method propoſed by *Scultetus*, (*in Armament. Chirurg.*) for the Elevation of the Skin, ſeems to me preferable to all the reſt, being both very ſafe, and approved by his own Experience. He orders the Hairs to be taken off about the Place where the Depreſſion is, and then takes a Lamb's-Skin very warm, which he faſtens to the Part by a certain Ligature, which he calls the *Cancer*; and at the ſame time anoints the adjacent Parts, but eſpecially the Neck and Temples, with adſtringent Oils, to prevent the Afflux of the Humours

Humours and Inflammations. If at the first time the Tumour is not taken off by the Skin, he applies a fresh One, which he keeps upon it for a whole natural Day. After the Tumour is dispersed, if there remains but a slight Depression, which is not attended with any ill Symptoms, which seem to indicate any preternatural Disposition of the Parts that are subjacent under the *Cranium*, he desists, and by way of corroborating the affected Part, applies only *Ceratum Diapulmæ Galeni*, spread upon a pretty broad Piece of Linen Cloth.

The Success of this Application seems to depend only on the Cuneiform Ligature; but if the Depression be very deep, and attended with dangerous Symptoms, we must have immediate Recourse to other Operations, which must be left to the Management and Discretion of an able Chirurgeon.

Besides this, the Orbits of the Eyes, the *Ossa Temporum*, as well as those of the inferior and superior *Maxillæ*, nay, even those of the *Scapulæ*, and even the broad and thin *Laminæ* of the *Ossa Ilium*, suffer sometimes a Depression, some more, some less: But these either happen very seldom, or else not without the Lesion of some other noble Parts; and are either scarce ever reduced to their natural Position, or else are restored to it of themselves without any external Assistance; and therefore we will not insist any further upon the Depressions of the infantile Bones, but proceed to give some Account also of their Incurvations.

These Incurvations or Distortions happen only in the long and streight Bones, especially in the *Ossa Humeri, Cubiti, Radii, Femoris, Tibiæ, & Fibulæ*, and in those of the *Metatarsus* and *Metacarpus*. And as among these also the Incurvations happen much more frequently in the Bones of the inferior Limbs than in the superior, we will direct our Cure to them; which may serve also for a Direction to the rest.

The Structure of the infantile Bones of the *Femur*, the *Tibia*, and the *Fibula*, and their flexible Substance, lead us naturally to the Cognition of the Causes of these Distortions, which may easily arise from any external Violence, such as Blows, Falls, Overstretching the tender Bones when the Child is over-eager to walk, or by a long Continuation of an irregular Position of the Feet, either whilst the Child is rowl'd up, or else in the Mother's Womb.

To remedy these Incurvations in the infantile Bones, some have had Recourse to Instruments made of hard and rigid Metals, as of Iron, *&c.* which being kept extended along the Legs and Feet, they propose by this Means to reduce them to their natural Position. But I am very much afraid, that such Iron Stays, or Engines, are too hard and rigid for the tender Bones of such young Infants, which may be more conveniently restored to their streight Figure by a gradual Extension of the Muscles. An Instance of this Kind I had not long ago in a Child of mine of about a Year old, which having got an Incurvation of the *Tibia*, just above the *Talus*, by the Carelesness of the Nurse, which bent inwards, I restor'd it to its natural Shape without the Help of any Instruments. In lieu of these Iron Instruments, you may put a pretty hard Pillow betwixt the Child's Legs, if they bend inwards; but if outwards, you may reduce them gradually by the Help of convenient Rowlers or Ligatures.

There is still a much more troublesome, and at the same time also a more dangerous Accident, belonging to the infantile Bones, to wit, when their contiguous Parts are separated and torn asunder, and that without any Luxation of the Joints, or Fracture of their contiguous Substance. For though there is a Contiguity also betwixt the *Heads* of the Bones and their proper opposite *Sinus's*, nevertheless the Defect of that Contiguity has not any Relation to this Separation of the contiguous Bones we are now going to treat of; because the Laxity and Mobility of that Contiguity, and the Permanency of that Laxity and Mobility, require a permanent, laxe, and moveable Separation, according to their natural Constitution. But this Contiguity we are speaking of at this time, as it is much firmer and immoveable, so if it be relaxed or vitiated, requires a speedy Reduction; for if it continues so for any considerable Time, it becomes incurable. Nay, such a Separation is not only attended with a great Deformity, but also with no small Danger.

Such

Such of the Bones of the infantile Skull as are contiguous to one another, either by a permanent Suture, or by ſuch as will be united by Coalition, are ſubject to this vitious Separation. Thus the *Oſſa Frontis, Syncipitis, Occipitis, Temporum*, of the ſuperior and inferior *Maxillæ*, nay, even the *Os Cuneiforme*, and that of the *Pubes*, are often ſeparated at a conſiderable Diſtance either from each other, or from the adjacent Bones, or ſometimes riſe with a deformed Protuberancy outwards above the contiguous Bones, or are depreſſed inwards below them, ſo as to form a deep Pit.

Unto the ſame vitious Separation are ſubject alſo moſt manifeſtly the long Bones of the Limbs, that have their *Epiphyſes* at their Extremities. Theſe *Epiphyſes* are ſometimes torn off from their principal Bones: For the *Epiphyſes* enter with their mutual Protuberancies into the mutual *Sinus's*, eſpecially in adult Perſons; and theſe Appendices, which are for the moſt Part cartilaginous in young Infants, ſhutting up as it were the ſmall Heads of the principal Bones within the oſſeous or oſſifying Cavity; and ſo theſe *Epiphyſes* being contiguous to the principal Bones, at leaſt on their Surface, adhere to them by an intermediate mucous *Gluten*, and conſequently their Separation is not impoſſible nor difficult. Beſides, that daily Experience furniſhes us with ſufficient Inſtances of ſuch-like Diſtances in the Sutures in the Skulls of Infants, and in the *Pubes*, as well as of theſe Divulſions of the Bones from their *Epiphyſes*. Theſe preternatural Diſtances and Protuberancies in the Extremities of the infantile Skulls, and the *Pubes*, as well as theſe Separations of the Appendices, are ſometimes ſufficiently obvious both to our Eyes and Hands, and would be ſo much more frequently, (in reſpect eſpecially of the *Epiphyſes*) if we had ſufficient Opportunity of handling and making a full Inſpection into the diſtorted Bones of the Arms, of the *Femur* and the *Tibia*, in young Infants.

The Truth and real Exiſtency of theſe Separations ought not to be call'd in queſtion, becauſe moſt, if not all, the Authors have been ſilent as to this Point: For though this Neglect or Overſight may be attributed to thoſe of the later Ages, *Hippocrates* has not been ignorant of them; for he not only (*Lib. de Articul.*) ſpeaks of that Separation which happens in the Chin, but alſo of the Divulſion of the Appendices; and even gives us his Direction how to reduce the Separation in the Chin; for he ſays, that any Body may do it: For, ſays he, if it ſtands outwards, it muſt be thruſt inwards by the Help of the Fingers; and if it ſtands inwards, it muſt be reduced outwards. And ſoon after he adds, *You muſt make uſe in your Cure, of a* Ceratum, *and ſome few Linen Ligatures.* And what can be more rational to conceive, than that any violent Compreſſion or Contorſion, any hard Blow or Fall, or any ſudden and extravagant Flexion or Extenſion, which may happen to affect the Infant, either whilſt it is as yet in the Mother's Womb, or after it is brought into the World, may be the Cauſes of theſe Separations and Divulſions?

But to come to the Cure of them, what has been alledged juſt now out of *Hippocrates*, concerning the Separation in the Chin, may very properly be applied alſo to the Cure of the Separations and Protuberancies in the other Bones of the *Cranium*, and of the *Pubes*, to wit, by the Help of our Fingers and proper Ligatures, ſo as to keep the diſtant Bones together, and depreſs their Protuberancies: But to raiſe up the depreſs'd Extremities of theſe Bones, you muſt have Recourſe to the ſame Means that have been preſcribed in the Cure of the Depreſſions of the Skull.

But the *Epiphyſes*, as their Separation from the principal Bone is ſubject to much greater Danger, ſo their Reduction to their natural Poſition is much more difficult: For conſidering that theſe *Appendices* are not only very ſmall, but alſo eaſily moveable to either Side, both in reſpect of the oppoſite *Sinus's*, and of the Muſcles and circumjacent Tendons that are affix'd to them, it is eaſie to imagine, that it is a difficult Task to take hold of them, and to extend, reduce, and keep them in their proper Places. And what is the worſt of all, is, that if this Separation or Divulſion is of any long Continuance, the Heads of the principal Bones, and the Parts of the Head being uncovered, and the Cavities alſo of the *Epiphyſes* themſelves being diſplaced and reduced, beſides the oppoſite

poſite Heads contract a preternatural Exſiccation, Induration, and Incruſtation; ſo that, though the ſmall Heads are never ſo much anſwerable to their *Sinus's*, they are unqualified for any laſting Coheſion or Coalition.

Nevertheleſs, whenever we are to attempt their Reduction, (as indeed it may and ought to be attempted, if the Divulſion be not of too long a Standing) the Firſt Thing to be done is to take hold of the *Epiphyſis* that is moved out of its natural Poſition, and ſo to fix it, that its Head may not only be exactly correſpondent to the oppoſite *Sinus*, or *Acetabulum*, but alſo that its Cavity may ſtand in a ſtreight Line with the principal Bone. The next Thing to be done is, to extend and attract the principal Bone in ſuch a manner, as to make it directly oppoſite to the Cavity of the *Epiphyſis* into which it was fix'd before, ſo that it may be thruſt directly into it. And theſe Two Bones being thus reſtored to their natural Contiguity, muſt be plac'd and kept in a ſtreight Poſture, much after the ſame Way as is practiſed in fractur'd Bones.

All theſe before-mention'd vitious Diſpoſitions of the Bones, as they are in a manner peculiar only to thoſe of young Infants, ſo the Account that has been given of them, will doubtleſs be ſatisfactory to thoſe that have in View nothing more than what relates to the vitiated infantile Bones: But they being beſides theſe ſubject alſo to ſome other preternatural Diſpoſitions, which require our particular Attention, and a peculiar Cure, foraſmuch as they are very different from thoſe Accidents that happen to adult Perſons in their more perfect Bones, in their Cauſes, Signs, and Cure, I judge it will not be beyond our Purpoſe, if we enter upon a more particular Conſideration of theſe different Qualifications.

Young Infants, as well as Adults, may be afflicted with a Corruption and *Caries* of the Subſtance of the Bones; as likewiſe with a Solution of the Continuity, or a Fracture, and with Luxations and Gibboſities. But notwithſtanding this, in all theſe moſt common Accidents, or at leaſt in ſome of them, there are certain Differences, in relation both of their Cauſes and Signs, and of their Cure, ſuch as are not only very well worthy and uſeful, but alſo abſolutely neceſſary, to be known by thoſe that apply themſelves to theſe Chirurgical Operations.

In the Firſt Place it is to be conſider'd, That the infantile Bones are more ſubject to theſe Diſtempers, becauſe their ſoft and tender Bones are more apt to be affected by the Afflux of, and to imbibe the acrious and noxious Humours. Their thin and tender Bones are not ſo well qualified to reſiſt external Injuries, but apt to break. Their Bones being deſtitute at their Extremities of the neceſſary Fences and ſtrong Coverture, are conſequently more ſubject to Luxations. And this Diſpoſition in the infantile Bones will appear as clear as Noon-day, to any Body that will conſider the Subſtance, Diviſions, Imperfections, and Defects, that are to be ſeen in the infantile Bones.

There appears alſo a conſiderable Difference in the Cognition of the Luxations, becauſe the ſame is not ſo obvious in Children as in Adults; whereas the Signs of the other before-mention'd Diſtempers are for the moſt Part common to both: For a Luxation is ſometimes contracted in the Mother's Womb, or elſe after the Child is born, without being perceiv'd by any Body, becauſe here the Luxations do not diſcover themſelves to the Midwives or Nurſes (who are for the moſt Part ignorant enough) by any manifeſt Tumors, acute Pains, or diſcoloured Surface in the Skin or Fleſh: Whence it comes to paſs, that they are frequently neglected, or not taken Notice of, and thus are continued not only to the Age of Maturity, but even for ever.

But notwithſtanding this ſeeming Difficulty, if Midwives and Nurſes would be attentive to all the Circumſtances that attend the infantile Luxations, the Diſcovery of them would not be involved in ſo much Obſcurity, as it ſeems to be at Firſt Sight, becauſe the Joint it ſelf by its Relaxation, one or both of the Bones by their prepoſterous Poſition, and the Defect or Imperfection in their Function, as alſo the adjacent Fleſh, by its Protuberancy, or by a Pit, nay, even by its excavated Subſtance, will diſcover the Luxation without any further Direction: For as it is beyond our preſent Purpoſe to enter upon a Conſideration and Contemplation of all the particular Luxations, ſo we need not inſiſt here upon an exact

exact Enquiry into the particular Signs of every Kind of Luxations: For the true and exact Diſcovery whereof, we refer thoſe that are deſirous to be more particularly inſtructed in it, to the Signs of Luxations which appear in adult Perſons, which, by making a due Compariſon of them to the infantile Bodies, will lead them into the true Knowledge thereof, without any further Inſtruction.

But before we conclude this Head, we muſt not neglect to add ſomething concerning the Difference there is in the Cure of theſe before-mention'd Diſeaſes, in relation to young Infants and adult Perſons, it being very obvious, even to thoſe of an indifferent Capacity, that the tender and imperfect Bones are not capable of admitting of the ſame Operations as are uſually applied to the more perfect Bones of adult Perſons.

This Difference in the Operations depends either on the Simplicity, Softneſs, Thinneſs, Rarity, or Weakneſs, of the oſſeous Subſtance, or on the Contiguity, Laxity, and Flexibility, of the *Epiphyſes*, or on the Cartilaginoſity of the Heads on the Extremities, or elſe on the Shallowneſs of the Cavity in the Articulations, or is owing to the Defect, Imperfection, Colliſion, or Fragility, of the Edges which encloſe the *Acetabulum*, or elſe to the Weakneſs of ſome of the other adjacent Parts. And therefore it is, that in all the Operations that are to be made in the infantile Bones, ſuch as Exfoliations, Perforations, Depreſſions, Elevations, Exciſions, Amputations, Uſtions, Extenſions, Reductions, Deligations, *&c.* you muſt proceed with much more Caution, Prudence, and Circumſpection, than in thoſe that are to be made upon the more perfect and more ſolid Bones in adult Perſons, unleſs you will put the Infant into imminent Danger either by your Ignorance or Neglect.

Thus if ſome Barber ſhould be call'd to take Care of a Wound in the Midſt of the *Front*, and ſhould meet with that Extenſion of the *Sutura Sagittalis* to the very Top of the Noſe, which is obſervable in Children, and being at the ſame time ignorant of any ſuch Thing, How eaſily might he miſtake this Protenſion of the *Suture* for a *Fiſſure* in the *Cranium*, direct his Cure accordingly, and expoſe the poor Infant to moſt imminent Danger?

Therefore as Parents tender the Welfare of their Children, they ought in ſuch-like dangerous Caſes to have Recourſe to able, underſtanding, and prudent Chirurgeons, ſuch as are well acquainted with, and experienc'd in, the natural Conſtitution of the infantile Bones, which, as it will lead them to the Cognition of their preternatural State, they ought to apply their manual Dexterity in the tender Bones of young Infants with more Caution and Circumſpection than in thoſe of adult Perſons.

And here ſome will perhaps expect I ſhould add ſomething alſo concerning the Teeth, which oftentimes prove not only very troubleſome, but alſo exceeding painful, to Children: But conſidering that in new-born Children (which are the main Objects of this ſmall Treatiſe) there are but very few oſſeous Rudiments of the Teeth, and that theſe Symptoms which uſually befal the Teeth, and conſequently their Cure, have a Relation to thoſe only that are paſs'd the Firſt Months of Infancy, I judge I may, without being liable to the Cenſure of having omitted any thing that actually belongs to my preſent Purpoſe, refer thoſe Conſiderations to a more proper Time and Place.

Volcher Coiterus, Doctor of Phyſick and Chirurgeon of *Nurenberg*, his Treatiſe of Humane Bones; containing an Account of the Bones of a *Fœtus* in the Womb, as alſo of an Infant of Six Months old; in which are explained the Firſt Origin of the Bones, their Encreaſe, and what Difference there is to be obſerved betwixt the Bones of young Infants and adult Perſons.

CHAP. I.

The Preface, giving a ſhort Account of the Deſign of this Tract, and ſome few Obſervations upon the Firſt Origin of the Bones.

AMong ſo great a Number of noted Anatomiſts and Chirurgeons, there have been none (except *Fallopius* and *Euſtachius*) who have applied their Study to the Scrutiny of the infantile Bones; though it is obvious by daily Experience, that the tender Age of Infants is much more ſubject to Contortions and Diſlocations, (by Reaſon of the ſoft Subſtance of the Appendages and Proceſſes of their Bones, and of their tender and imperfect Articulations) than thoſe that are arrived to the Age of Maturity.

Being moved with Compaſſion towards thoſe poor Infants, who, after they have had the Misfortune of a vitious Conformation in their Bones, and a preternatural Diſpoſition in the Joints, fall too frequently into the Hands of raw, ignorant, and pretending Barbers, Bone-Setters, old Women, *&c.* who, inſtead of reducing them, moſt commonly leave them much worſe than they found them: Whence it is, that we ſee daily ſo many Spectacles and Objects of Pity among poor young Infants, ſome with monſtrous Heads, others crook'd Back'd, ſome with diſtorted or luxated Ankles, *&c.* Being, I ſay, moved with Pity, and willing to contribute towards the redreſſing of theſe Grievances and Miſeries, I did take effectual Care many Years ago to provide my ſelf at *Bononia* with divers Skeletons of young Infants, in order to explain and demonſtrate to my Auditors the Difference there is betwixt theſe and thoſe of adult Perſons, which now, for the Benefit of the poor Infants, and of thoſe that are deſirous to apply themſelves to this Study, I have thought fit to expoſe to the View of the Publick, together with ſome few Obſervations made by others upon the ſame Subject.

To

To begin therefore with the First Origin or Beginning of the Bones, *Hippocrates* (*de Nat. Part.*) ſays, in Males there is to be obſerved a Coagmentation and a Beginning of the Articulations in Thirty Days, but in Females in Two and forty, leſs or more. *Fernelius* ſays, That all the Parts begin to make ſome Appearance of their Diſpoſition and Conformation in Twenty ſeven Days, but appear perfectly in Males in Thirty Days, and in Females in Thirty ſix. He adds further, That he had ſeen a *Fœtus*, which was ejected by Abortion Forty Days after its Conception, of the Bigneſs of half a Finger, which was actually compleat in its Conformation, for all the Parts appeared white and ſpermatick. I my ſelf ſaw once ſuch an one at *Bononia*, at Dr. *Arantius's*. *Fernelius* tells us, concerning his beforemention'd *Fœtus*, that its Head was of the Bigneſs of an Haſle-Nut, being ſomewhat big in Proportion to the reſt of the Body. The Eyes ſtood out of the Head like thoſe of the Crawfiſh: The Noſe, the Ears, the Arms, Hands, Legs, Feet, Fingers, and Toes, and the *Penis* alſo, with the *Scrotum*, being about the Bigneſs of a Grain of Millet, were diſcernable. The upper Parts were bigger than the inferior, but without any oſſeous Solidity, every Thing being pliable and flexible. *Hippocrates* ſays, That after the Parts encreaſe in their Figure, and the Articulations appear, the more ſolid Parts of the Bones, as well as their Cavities, begin to be framed. I my ſelf did at my own Houſe in *Bononia*, ſhew to my Auditors ſuch a *Fœtus*, which was of the Bigneſs of the Length of a Finger, and had the compleat Figure of a Man. I found and demonſtrated in this Skeleton very plainly the *Oſſa Bregmatis*, the *Oſſa Syncipitis & Occipitis*, very ſoft, conſidering the Age, or Time ſince the Conception of the *Fœtus*. The *Oſſa Bregmatis* were remarkably divided aſunder. All the Limbs were regularly ſhaped, and ſo were the *Penis*, the Ears, the Fingers, and the Toes. In an Abortive *Fœtus*, which was ſtill younger than this, I did obſerve the Rudiments of the *Spina Dorſi*, but very obſcurely, from whence did proceed ſome very ſmall Delineations of the Ribs; but the Limbs appeared hanging on the Trunk, like ſo many rude and undigeſted Fibres. The Head was very large in Proportion to the Body, and very long, not unlike the Head of an Ape.

CHAP. II.

Of the Production of the Bones in Abortive Fœtus's *of a larger Size.*

IN a larger *Fœtus*, the Bones of the Head, of the *Scapulæ*, the *Oſſa Ilium*, and the *Os Sacrum*, have their Riſe or Origin of Generation, not from the Extremities, but in the middle Part of the Bone lengthways, from whence they are on both Sides expanded and extended towards their Extremities, and thus encreaſe both in Length and Breadth till they come to their due Magnitude and Figure. There are alſo ſome Bones which take their oſſeous Principles not only from one certain Place, but from divers Points; ſo that before they come to their full Perfection, they ſeem to be divided into ſeveral Bones. Of this Kind are, the *Os Occipitis*, *Syncipitis*, *Os Ilium*, the *Os Sacrum*, and all the *Vertebræ*, but more eſpecially the Firſt and Second *Vertebræ* of the Neck. Some of the Bones, as thoſe of the Foot, of the *Talus*, the *Carpus*, the *Calx*, and the *Sternum*, are at firſt of a ligamentous, and afterwards cartilaginous Subſtance, being rude, and without any Figure. In the Beginning there are no Proceſſes, nor Appendages. As the *Fœtus* grows bigger, theſe Extremities of the Bones become cartilaginous, and begin to be form'd into a certain Shape or Figure, till in a certain Time after their Firſt Procreation they degenerate into Bones. This Tranſmutation

of the Proceſſes, and of the *Appendages*, does not begin at the Bone unto which they are united, but at the Centre, where they firſt of all begin to acquire an oſſeous and ſpongeous Subſtance. This Subſtance encreaſes by degrees from the interior Part to the exterior, or from the Center to the Circumference: Whence it is, that being inveſted and covered every Way with a Cartilage, they are not eaſily diſcernable. The ſame Thing is obſervable alſo in the Bones of the Wriſt, and of the Feet. 'Tis further obſervable, That all the *Appendages*, which are join'd with the Bones in adult Perſons by a *Synchondroſis*, have been cartilaginous at their Firſt Beginning. Thus much in general: We will now give an Account alſo of the Bones of an Infant in particular, and begin with the Head.

CHAP. III.

Begins with the Skeleton of an Infant of Six Months old, the particular Bones whereof are deſcribed in their peculiar Chapters; this treating of the Sutures.

IN Relation to the Sutures of the Head, it is obſervable, That they are no *true* Sutures, but rather *Harmoniæ*. Beſides the Sutures, or *Harmoniæ*, they have common with Adults, there is a peculiar One belonging to Infants, which divides the *Os Frontis* into Two equal Parts, and reaches to that *Harmonia* which ſeparates the Back of the Noſe. *Fallopius* ſays, That once in his Lifetime he ſaw the *Sutura Sagittalis* paſſing through the Middle of the *Os Occipitis*, and extended to the *Foramen* of the Spinal Marrow. The *Coronalis* is as it were intercepted by that membranous Part of the Skull which in Children is diſtinguiſh'd by its pulſatile Motion, and commonly call'd the *Fontanella*. The Proceſſes of the *Harmonia Lambdoides* follow the Parts of the *Os Occipitis*, which are ſurrounded and enclos'd by them in the Beginning by Means of very looſe and broad Membranes and Ligaments. The *Oſſa Temporum*, conſiſting of Two Parts in young Infants, have alſo a Suture, which diſtinguiſhes them one from the other. The *Harmoniæ* in the *Superior Maxilla*, are the ſame as in adult Perſons: And the *Inferior Maxilla* is divided in the Middle, where the *Mentum* is, by a *Fiſſura*, or *Linea*.

CHAP. IV.

Of the Bones belonging to the Head.

THE Bones of the Head are in new-born Infants extreamly thin and pliable, and diſtinguiſh'd by broad Sutures, or *Harmoniæ*, fill'd up with Membranes, where the *Sutura Sagittalis* is to have its Termination at the *Coronalis*. The Skull wants or is deſtitute of a bony Subſtance, the Interſtice, or Interval, which is pretty large, being fill'd up in lieu of a Bone with a thick cloſe Membrane, which in Time turns into a Bone. This membranous Place is call'd the *Fontanella*. The *Os Occipitis* conſiſts moſt commonly in new-born Children of Four Parts, till they are a Year old, as *Fallopius* has obſerv'd; if-

it. The First is the whole Expansion of that Bone which is adjoining to the *Cerebellum*, and which is enclosed by the like Divarications of the *Sutura Lambdoidalis*. This Part is always entire, and never to be found divided into Two Parts; though *Fallopius* says, he saw it once separated, to wit, by a Section in the very upper Part. Unto this you must add the Second and Third Parts, which form the lateral Parts of the *Foramen Magnum*, and contain the *Coronæ*, which are described by the Additaments of the *Sutura Lambdoides*. The Fourth and last Part is that which joining together the Second and Third, make up the anterior Part of the *Foramen*. This Part is distinguish'd by the exterior Additaments of the *Sutura Lambdoides*, as also by that Line which conjoins these Additaments, and divides the *Os Occipitis* from the *Os Cuneiforme*. These Divisions and laxe Conjunctions, especially in the *Os Occipitis & Frontis*, are of singular Use to Infants at the Time of Parturition; for the Head being press'd together, facilitates its Extrusion and the Delivery, because they are tied together by very laxe, soft, broad, and flaccid Membranes and Sutures, which makes them to give way. From whence it is evident how far those are in an Error, who pretend, that during Parturition the *Ossa Pubis* of the Woman in Labour are separated from each other, but after the Delivery are reunited again.

The *Ossa Bregmatis* are entire in young Infants, except that in the superior Part of the Head, where I told you that the *Fontanella* is to be seen in Infants, and where they are join'd together in Adults, there is so much wanting of them as is contained within the Interval of that Aperture. The *Ossa Temporum* are very much divided into Two Parts in Infants, one of which is the *Squammosa*, and the other seems to make up a great Part of the *Os Petrosum*, or the Organ of Hearing. In Calves, Lambs, and young Goats or Kids, these Parts are plainly distinguish'd. In the Skulls of adult Persons is to be seen on the inner Side a manifest Suture, betwixt the *Os Petrosum* and the *Squammosum*; but on the Outside there appears not the least Sign of any Separation.

The *Meatus Auditorius*, or the internal Canal, is not altogether of a bony Substance in young Infants, but rather inclining to a cartilaginous Nature; so that it may be divided till the Seventh Month after the Procreation. But the small Bones which belong to the Organs of Hearing, are from the Beginning in a Manner of the same Substance, Magnitude, and Figure, as they are in adult Persons.

The *Os Basilare*, or *Cuneiforme*, is composed of Four Parts in young Infants, Two of which are formed by the *Processus Alares*, the Third by the *Sella* which receives the Pituitary Gland, and the Fourth is design'd for the Optick Nerves. They are united by Coalition not long after the Child is born. 'Tis observable also, That the Cavities in the *Os Frontis*, above the *Dorsum* of the Nose, under the *Sella*, in the *Os Sphenoides*, in the *Os Mali*, in the *Mammillar* Processes, and in some other Places, which are pretty large in adult Persons, are either not extant at all in young Infants, or else very small. The Processes also, and all the interior as well as exterior Prominencies, do not begin to appear till some Years after. The Cavity of the *Os Mali*, when it begins first to be framed, is invested with a very thin Membrane on its interior Surface, and is often full of a certain mucous Substance. The Bones of the superior *Maxilla* are the same here with those of adult Persons, as well in respect to their Number, as to their Figure and Position; excepting what relates to that small Difference in the *Alveoli* of the Teeth. The *Os Cribriforme, sive Ethmoides*, is altogether cartilaginous in young Infants; but the *Septum* is the First that turns osseous, the other Parts not acquiring their Solidity till a long Time after. The inferior *Maxilla* is divided in Two Parts, as is evident from the *Harmonia*, which is not worn out till many Years after.

CHAP.

CHAP. V.

Of the Teeth.

THE Teeth in young Infants, whilſt they are yet in the Womb, and for a good while after, conſiſt of a mucous Subſtance, incloſed in a *Folliculus*, repreſenting the Figure of a Tooth without its Root. Their Alteration begins at the Point or Extremities; ſo that the Circumference begins firſt to acquire the Nature of a Tooth, and the whole *Mucus*, or Firſt Rudiment of the Tooth, begins to be incruſtated. Thus by Degrees the Subſtance of the Teeth encreaſes from its exterior Circumference, till it is converted into a Tooth. Theſe Teeth, which have acquired the Firſt Beginnings of their Generation in the Womb, begin to appear without the Gums about Seven Months after the Child is born; and in the Seventh Year of Age they fall out, and from that Time other new Teeth come forth in their Stead, which with their Roots form the entire Cavity of the Tooth. The Procreation of the Teeth is very different from what is obſerved in that of the Bones: for the Bones are made by the intermediate Cartilages, but the Teeth are out of the *Mucus* converted into the Subſtance of the Teeth, without the Intervention of any *Medium*. And therefore it is my Opinion, that the Teeth are no Bones, but a Subſtance or Body of its own Kind, being much harder, whiter, and more ſolid, than that of the Bones. Whatever might be added more concerning the Teeth, we will reſerve for a peculiar Tract.

CHAP. VI.

Of the Os Hyoides *and the* Vertebræ.

IF the *Os Hyoides* conſiſts of any more than One Part, they are ſo tender and ſoft, as ſcarce to deſerve the Name of Bones. All the *Vertebræ*, excepting the Two Firſt, conſiſt for the Firſt Year of Three Parts; the Firſt of which is call'd the Body of the *Vertebra*, and the other Two, which make up the *Latera* of the Cavity, or the *Foramen* through which paſſes the Spinal Marrow, are the Proceſſes. Concerning the Firſt *Vertebra*, *Fallopius* ſays: 'This ſeem'd to me, in 'Children that were born before their Time, 'and died ſoon after, to conſiſt of Five Parts, 'and in ſome others of Three only. Where 'it did conſiſt of Five Parts, they were 'thus; The Firſt was the anterior Part, 'which was inſtead of the Body, and fa'ſten'd to the *Dens*. The Second and Third 'were the lateral Parts, in which were both 'the ſuperior and the inferior *Sinus's*. Theſe 'Two Parts appear moſt commonly to be 'cartilaginous. The Fourth and the Fifth 'were thoſe that made up the whole Body 'of the *Foramen*." Thus far *Fallopius*.

In the Skeletons that I have by me, there are no more than Three Parts belonging to the Firſt *Vertebra* of the Neck, to wit, the Firſt, which is inſtead of the Body of this *Vertebra*, and altogether cartilaginous; and the other Two, that make up the Sides of the *Foramen*. The Second *Vertebra* of the Neck has, beſides the Three Parts aſſigned to the other *Vertebræ*, another alſo, call'd the *Dens*. The whole ſpinous Part of the *Vertebræ*, on the poſterior Part, is cartilaginous at firſt, but afterwards turns oſſeous, and is agglutinated to the reſt like an Appendix. In the Skeleton that you ſee here there is to be ſeen ſtill a Diviſion through the Middle. The tranſverſe Proceſſes of the

Verte-

Vertebræ of the *Thorax*, before the Bones of the Animal come to their Solidity, have abundance of a cartilaginous Subſtance at their Extremity, which, after they are become offeous, form the Protuberancy and the *Sinus*, unto which the Rib is inſerted.

CHAP. VII.

Of the Os Sacrum, *and the* Os Coccygis.

THE *Os Sacrum* conſiſts of Five *Vertebræ*, ſeparated from each other by intermediate Cartilages, in the ſame Manner as are the *Vertebræ* of the *Thorax* and the Loins. Theſe *Vertebræ* alſo, like the reſt, are compoſed of Three Parts: But the *Spina* being compoſed of the ſtreight Proceſſes of the *Vertebræ*, is more cartilaginous in the *Os Sacrum* than in the *Vertebræ* of the Back: But the Two lateral Parts, where they ſhould be joined in the *Spina*, are a good Way aſunder. The *Os Coccygis* is all over cartilaginous, and entire without any Separation. As the Child grows older it is divided into Four Parts, when the *Os Sacrum* is compoſed of Five *Vertebræ*: It is divided into Three, when the *Os Sacrum* conſiſts of Six *Vertebræ*. Theſe Cartilages retain their proper Nature till the Seventh Year of Age; but afterward become offeous, and are conſolidated into One Bone.

CHAP VIII.

Of the Ribs, *and the* Scapulæ.

N the Ribs, like in moſt other Bones, all the Appendages are cartilaginous at firſt: he Bones of the *Scapulæ* are ſome of the irſt which are generated in the Womb. n this our Skeleton they are almoſt compleat, except that the Proceſſes and Appendages are cartilaginous, but eſpecially the greateſt Part of the Neck, to wit, the *Acetabulum* of the *Humerus*, and the Proceſs *Anoyroides*.

CHAP. IX.

Of the Sternum.

HE Bones of the *Sternum* make, with the Cartilages, as far as to the Ribs, but e continued Cartilage; after which they pear in Five Ranks of Bones. In the rſt is the Firſt Bone, which receives the *rviculæ*. After this come the Second and ird, being ſeparated one from another by ge Cartilages. In the Fourth and Fifth Two Bones in each; but theſe are leſs n the former. *Fallopius* numbers Eight them. In the Two laſt Ranks the Bones gradually united by Coalition, and ke but one Bone. *They grow daily harder and harder, and more ſolid,* (ſays *Fallopius*) *but remain ſeparate for Seven Years. After the Child is Seven Years old, they begin to be united by degrees, and grow leſs in Number; ſo that there are no more to be ſeen than Six of them, the Fourth and Fifth being united into One Bone, and the Sixth and Seventh into another. And this Union proceeds ſtill gradually; ſo that at laſt there are no more than Four Bones, the Third, Fourth, Fifth, Sixth, and Seventh, being at laſt united into One Bone: For the Firſt broad Bone among them remains ſtill entire, as does alſo the Second and the Laſt; unto which is annexed the*

Carti-

Cartilago Mucronata: *But all the other intermediate Ones make together but One Bone, which makes up the Number of Four; but in Proceſs of Time are reduced to the Number of Three by the Coalition of the Second and Third. In adult Perſons the laſt Bone is united to the Second, which is compoſed of ſeveral others; ſo that there remain now no more than Two, to wit, the Firſt and Broad One, and the other, which is compoſed of the other Seven: But when the Perſon comes to a more advanced Age, about the ſame Time when ſometimes the Sutures begin alſo to be obliterated, it happens ſo, that this Diſtinction betwixt theſe Two Bones alſo is obliterated, and they are united into One Bone.* Thus far *Fallopius.*

Euſtachius confirms the ſame Thing in his Account of the *Sternum.* 'The *Sternum* of 'young Infants is altogether cartilaginous 'at its Firſt Generation, in one Continuity, 'and not diſtinguiſh'd by any Line or 'Tract. So ſoon as it begins to approach 'to the Nature of a Bone, the ſuperior 'Parts appear like an oſſeous Subſtance 'ſooner than the inferior, and the middlemoſt (meaning in Breadth) ſooner than 'the Extremities. Whence it is, that thoſe 'oſſeous Parts being incloſed on all Sides 'with Cartilages, appear like ſo many 'Nodes or Inequalities on a Table. When 'the Child is juſt born, the inferior Parts 'of the *Sternum* remain ſtill cartilaginous, 'without any Diſtinction; but after that, 'thoſe alſo become oſſeous, in that Manner 'as I have ſhewn before; ſo that at laſt the '*Sternum* contains only Six Parts, diſtinguiſh'd from one another by a tranſverſe 'Line, proceeding from the Cartilages of 'the Ribs; among which I comprehend 'that alſo which is above the *Cartilago Mucronata:* For as the inferior Ribs are leſs 'diſtant at their Inſertions than the ſuperior, 'the Sixth, where it is articulated with the 'Breaſt-Bone, is ſo near to the Seventh, that 'it is almoſt contiguous, and therefore there 'cannot remain either any Diviſion, or any 'Tract of a Diſtinction of it in the *Sternum* when it becomes oſſeous. It happens 'alſo ſometimes, that theſe Bones, excepting 'the Firſt and the Laſt, to wit, all the intermediate Ones, or at leaſt ſome of them, are 'diſtinguiſh'd from each other by a very 'plain and conſpicuous Line, extended ſometimes directly, ſometimes obliquely, through 'their middle Part lengthways: Whence it 'is, that ſome have divided the *Sternum* into Nine and Ten, and others into Seven 'and Eight Parts. The Number of the 'Bones of the *Sternum* is different alſo in 'adult Perſons, for it conſiſts ſometimes of 'Four, and ſometimes of Three only. 'That Line which diſtinguiſhes them is obliterated ſooner in the inferior than in the 'ſuperior Parts: And it happens ſometimes 'alſo, that the *Sternum* has a broad *Foramen,* which is quite pervious.

CHAP. X.

Of the Humerus, *the Arm, the* Femur, *and the Leg, in general.*

THE *Appendages* of the Bones of the *Humerus,* the Arm, the *Femur,* and the Leg, are cartilaginous, and not framed as yet exactly into their natural Figure. In the *Humerus* the *Corona,* together with the *Cavity* call'd *Sigmoides,* is as yet cartilaginous, but turns oſſeous ſoon after; and the Appearance of the *Appendix* is ſooner aboliſh'd than in other Places.

CHAP. XI.

Of the Arm, *and its Parts.*

THE poſterior Proceſs of the *Ulna,* call'd the *Cubitus,* is an *Appendix,* and in a Manner cartilaginous till the Seventh Year of Age. After the Seventh Year it begins to

to acquire a Solidity; and when it is become quite osseous, it is united with the rest of the Bone. The Bones of the *Carpus* consist only of One Cartilage when the Infant is born; but afterward they turn into Bones, and are divided from one another. They begin first to acquire a spongeous Substance, like most of the other Bones, which from Cartilages do degenerate into Bones. The Eighth Bone of the *Carpus* is that which last of all acquires an osseous Substance. In the Fingers, as well as in the Toes, the Processes or Heads of the Bones, which are design'd for their Articulations, are all of them cartilaginous.

CHAP. XII.

Of the Os Ilii.

THE *Ossa Ilii* consist in Children of Three Parts, till the Seventh Year of Age; so that the Ancients were not in the Wrong when they distinguish'd it into Three several Parts, and gave to each of them its peculiar Name. Among these, the First, and at the same time the biggest Part, contains the whole Breadth of the *Os Ilii*, and forms also the superior Part of the *Cotyla*. The least of the Three is that which reaches to the *Pubes*, and occupies the anterior Part, in Conjunction with a great Part of the Cartilage, which is plac'd in the middle Region of the *Pubes*. In the inferior Part it forms One half of that *Foramen*, which is the biggest, and very conspicuous in this Bone. On the Sides, towards the First Bone, it makes the anterior Part of the *Cotyla*. In the inferior and anterior Part of the beforesaid *Foramen* it is distinguish'd from the Third Bone by a large Cartilage. The Third, which, in respect to its Magnitude, is less than the First, but bigger than the Second, forms the whole posterior and anterior Region of this Part of the *Os Ilii*, and makes the inferior, the posterior, and as it were all the middle Part of the *Acetabulum*. And from hence it is, that it has obtained the Name rather of the *Cavitas Ischii & Coxæ*, than of the *Ileon & Pubes*. This Third Bone comprehends within its Compass also the whole superior and posterior, and in a manner half the Circumference of the beforesaid great *Foramen*.

CHAP. XIII.

Of the Femur, *the* Tibia, *the* Fibula, *and the* Foot.

THE *Ossa Femoris*, *Tibiæ*, and *Fibulæ*, do not differ from those of adult Persons, excepting in their *Appendages* and Processes. The *Patella* is all over cartilaginous, and continues to be such for many Months at first, but afterwards becomes osseous. In the Foot also the Bones of the *Tarsus* are for many Months like those of the *Carpus*, nothing else but Cartilages, excepting the *Os Calcis*, which in its Middle has something that is of an osseous Nature. In the Skeleton that is before us, the *Ossa Tali*, *Calcis*, & *Cubiformia*, are not all over of a cartilaginous Substance, but have something that is osseous in the Middle, though they have not as yet attained to their natural Figure: And they are so far involved within the Cartilages, that they are not discernable to the Eye till the Cartilaginous Part is taken off.

CHAP. XIV.
Of the Ossa Sesamoidea.

THE Bones call'd the *Sesamoidea* continue to be cartilaginous till the Person is almost very well advanced in Years, excepting Two of them, which are plac'd under the First Joint of the Great Toe: For these begin to be somewhat solid soon after the Birth of the Infant, and become osseous by Degrees.

CHAP. XV.
Contains the Conclusion.

BY Way of Conclusion it is to be observed, That Nature, in reference to the infantile Bones, has not confined herself to one stable or immutable Rule, because we meet here with no small Variety, as well in their Number, and in their Solidity, as in Relation to the Time of their Perfection: For such Bodies as are of a soft, moist, and laxe Constitution, most commonly are apt to progenerate in the Beginning softer Bones, and more in Number than what is observ'd in hard and dry Bodies; and they also come much later to their full Perfection: Nay, what is more, I have observed in some robust hard Constitutions, as Labourers, Country Fellows, and such-like rustical Bodies, as also in some aged Persons, some of the Ligaments, as well as the Cartilages, but most especially the *Larynx*, to be turn'd absolutely into Bone: But what Account I have given you concerning the infantile Bone, must be understood, and supposed to happen most frequently and most commonly in that Manner it has been related here.

Theodore Kerkering's *Anthropogeniæ Ichnographia.*

The following Tract, though relating to the Generation of Man in General, yet was judged not improper to be inserted here, it serving as an Introduction to the following Treatise of the Osteogeny *of the* Fœtus; *written by the same Author.*

CHAP. I.
The Ovum Humanum.

WHO would have been apt to imagine, That there are Eggs in humane Kind, which, as well as those of Birds, contain the First Principles or Rudiments of Generation of Men? And yet this is an undoubted Truth, founded upon unquestionable Experience: (See *Fig.* I. in *Tab.* I.) These *Ova* are not only found in the Testicles of married Women, but also in Virgins, in the same Manner as we find them in Pullets which will lay Eggs though they have no Conversation with a Cock. These Eggs are less or more,

more, of the Bigneſs of a green Pea, containing within them a Humour, which when it is boiled becomes hard, juſt like the White and the Yolk of a common Egg. They are of a very harſh and ungrateful Taſt, and are involved in one or more Membranes on their Outſide, which, ſoon after they are transferr'd into the Womb, become expanded, and transform'd into the *Amnion* and *Chorion*.

'Twas this that made me doubtful, whether the humane Egg was involv'd in One or Two Involucres; for I found that it produc'd a double Membrane, and yet could not perceive by the Eye that it had more than One. *Fallopius* ſeems to have diſcovered theſe Eggs before me; for, he ſays expreſly, he had obſerv'd in the very Teſticles of the Women, certain Veſcicles full of a wateriſh or aqueous Humour, which ſometimes appear'd of a yellowiſh Colour, and ſometimes was tranſparent. Concerning the Uſe of theſe Eggs in the great Work of Generation, and in what Manner Conception is tranſacted, that learned Anatomiſt *Thomas Wharton* has left us a circumſtantial Account in the 33d Chapter of his *Adenographia*.

For the *Semen Virile* being, through the *Tubæ Cæcæ* of *Fallopius*, carried through the Teſticles, is there mix'd with the Egg, in the ſame Manner as it happens in other oviparous Animals, by a moſt admirable, and hitherto undiſcover'd, but nevertheleſs true and undeniable Contrivance of Nature. This Egg being thus impregnated, and carried through the *Vas Ejaculatorium* to the *Uterus*, does there, within the Space of Two or Three Days encreaſe to the Bigneſs of a large black Cherry, quite otherwiſe than what has been obſerved by the great and learned *Harvey*, who, in his Treatiſe of Generation, gives it as his Opinion, That after a Woman is begot with Child, there is nothing to be ſeen for ſome of the Firſt Days in the *Uterus*.

'Tis further obſervable, That married Women, as well as Virgins, oftentimes excern theſe Eggs, without being ſenſible of it, becauſe they are not awares of any ſuch Thing. But I ſpeak it upon the Credit of ſome who have confeſs'd it to me, that when they are, they may eaſily diſcover it. When theſe Eggs are caſt, they are ſomewhat bigger than thoſe that we have repreſented in the Firſt Figure. Neither do they retain their Rotundity, being ſoft and pliable; and therefore if they are handled or ſqueez'd in the leaſt, the Membrane will give way to the Touch: Whence it is evident, that this is no Seed, or ſomething that is like Seed, but that they are the ſame Eggs we ſpeak of. The Excretion of theſe Eggs happens moſt commonly juſt before the menſtruous Purgations, or elſe when they are ſeized with ſome laſcivious Fits or Actions.

CHAP. II.

Of a Fœtus *of Three or Four Days at moſt.*

I Had the good Fortune to light accidentally upon a *Fœtus* of Three, or at the outſide of Four Days; a Thing which perhaps may not happen to a Man again in ſeveral Years; which I have repreſented in *Fig.* II. *Tab.* I. For a certain Woman happening to die ſuddenly within Three or Four Days after her menſtruous Purgations, and being admitted to open her, I found in the Womb a certain round Maſs, of the Bigneſs of a large black Cherry. I ask'd the Husband, whether he had had any carnal Converſation with his Wife ſince her *Menſes* ceaſed; and being told that he had, I deſired Leave to carry this ſmall round Subſtance home with me. This being eaſily granted, I found after I had open'd it, that Nature had not been Idle, but in this ſmall Space of Three or Four Days, had already form'd ſomething like the Rudiments of a Man, in which I could plainly diſtinguiſh the Head from the Trunk of the Body, and alſo obſerve, though very obſcurely, not only in the Head, ſome *Puncta* which were the Principles of the Organs, but all the reſt of the Body appeared to be one rude

and undigeſted Maſs of the ſame Bigneſs, as it is here repreſented in the Cut. And that this *Fœtus* was of no more than Three or Four Days, is evident (beſides what is verified by the before-mentioned Event) from the Deſcription of the Second and Third, as well as of the other ſucceeding *Fœtus's*; each of which, by its Magnitude, diſcovers ſufficiently the different Space of Time from its Conception.

CHAP. III.

Of a Fœtus *of Fifteen Days.*

'TIS almoſt paſt Belief how expeditious Nature ſhews her ſelf, after ſhe has once begun the Work of Generation, in the diſtinct Formation of the Parts. The *Fœtus* I have repreſented to you here, in *Fig.* III. *Tab.* I. is ſcarce of Fifteen Days ſtanding after its Conception, and nevertheleſs here you may already obſerve in the Head ſome Appearances or Diſtinctions of the Eyes, Noſe, Mouth, and Ears, and in the Body the Arms and Legs, which I give you here in the ſame Manner it offered it ſelf to me. I durſt not as yet be ſo bold as to attempt the Separation of the Fleſh, Bones, or rather of the Cartilages, which afterwards turn into Bones, from the other fleſhy Maſs, they being too tender as yet to be expoſed to the ſevere Trial of the Diſſecting-Knife; wherefore I judged it moſt convenient to expoſe this tender Embryo to your View, that ſo your Eyes might afford you that Satisfaction which is not eaſily expreſs'd in Writing.

CHAP IV.

Of a Fœtus *of Three Weeks.*

FIG. IV. *Tab.* I. gives you a Delineation of a cartilaginous Man, ſuch a one as Nature has framed in Three Weeks Time. I now began to enter upon a Separation of that Subſtance which was intended for the Formation of the Fleſh, the Skin, and the Bones. There was nothing in it as yet of an oſſeous Nature; nevertheleſs you might diſcover the Rudiments, and, as I may ſay, the rough Draught, of Bones in the Cartilages. The Head, which is to be the Reſidence of the Brain and Wiſdom, is nothing elſe hitherto but a Membrane, inflated by ſome aereous or ſpirituous Matter. The Arms and Hands have already their Figure, and even the Fingers their Diſtinctions. In the cartilaginous *Grate* you may number the Rudiments of the Ribs, which are to ſerve as a Fence to the Heart and Lungs; and from the Cavity of the *Abdomen* you may alſo diſtinguiſh the Toes, which are ſcarce of the Thickneſs of a Hair's Breadth; which being impoſſible to be repreſented in the Delineation, muſt be left to the Determination of a quick-ſighted Eye.

CHAP. V.

Of a Fœtus *of One Month.*

THE *Embryo* you behold in *Fig.* V. *Tab.* I. is of a Month's Standing, unleſs you would have it rather ſtiled an animated Infant, it having already the perfect Figure of a Man, and an oſſeous Solidity in divers Parts. This Machine begins by this Time to

o reſt upon its own Bottom. The ſuperior s well as the inferior *Maxilla* ſhews its oſ- eous *Puncta*. The Clavicles are formed; nd all the Ribs diſtinguiſh'd by their oſſeous *Punctula*, excepting the firſt and laſt, which iſcover not any thing that is oſſeous even n the Second Month. The Arms are al- eady diſtinguiſh'd in the *Humerus*, and both he *Cubitus's*. The *Femur* ſhews it ſelf, and he Legs have both their *Focilia*; whereas in ny Oſteogeny I told you, That I had not met with the *Focile Minus* in a *Fœtus* of Two Months; which I ſuppoſe happened thus, ecauſe in the Diſſection I did ſpoil that ten- er Rudiment of that *Focile Minus*: How- ver, I did not tell you there, That there as no ſuch Thing, but only that I did not ee it. Purſuant to that Rule, I have pre- crib'd to my ſelf, not to inſiſt upon any Thing that is founded meerly upon a Nega- ive of the Authority of other Anatomiſts; or what we ſee and feel, we may aſſert to e ſuch. Unto which we may add, That ve did not meet with what has been aſſerted y others; but thence no Inference muſt be ade, That there is no ſuch Thing, or elſe that others have aſſerted ſuch Things as are not extant, eſpecially in Things of this Nature, where the Cartilages being no bigger than a Hair, may eaſily eſcape our Eye-ſight; and a Thing may be ſpoiled in the Operation, as it happen'd to me at this Time; and therefore I judge I may poſitively affirm, That both the *Focilia* are formed diſtinct from the very Beginning, ſince they are ſo plainly conſpicuous immediately after the Firſt Month, that they may be ſeparated from the carneous Maſs, and be ſeen diſtinctly. Caſt your Eyes upon the Figure, and whatever you obſerve there that is white, you muſt look upon as being of an oſſeous Nature already. I might enter here upon an Enquiry, What it is that gives the Bones their Solidity? and ſhew you, that there is in the Mucrocoſm a certain univerſal *Spiritus Acidulus*, (ſo much celebrated by all the true Chymiſts) which being the Father of all that is firm and ſolid, produces a Soſidity in the Bones, Metals, Minerals, Woods, *&c.* but that I judge it ſuperfluous to enter upon any Philoſophical Queſtions in ſo ſmall a Tract.

CHAP. VI.

Of a Fœtus *of Six Weeks.*

E that will duly compare the Bones of a *Fœtus*, will be ſurpriſed to find, that he latter always exceeds the next preceding n Bigneſs in a double Proportion: And this *ætus*, though it is inferior to that of Two Months, repreſented in our *Oſteogeny* in the me Proportion, yet the other does not ex- ed it much in the Specification of the ones; for in that you ſhall ſcarce meet ith any Part that is oſſeous, which re- ains ſtill wholly cartilaginous in this. is true, in the other there is an Addition, ot only in the Quantity of the Parts, but lſo in the Magnitude of the Bones: But fter all, there is nothing in that which has aſſumed the Nature of a Bone, but what ews its Beginnings in this.

But what is particularly remarkable in is *Fœtus* of Six Weeks, relates to the infe- or *Maxilla*, which therefore I have cauſed to be engraven apart; for it conſiſts already of Six ſmall Bones, which after the Birth are united in One. 'Tis almoſt ſurprizing to ſee the *Claviculæ* already ſo large and ſo firm, as to ſerve the Heart for a ſecure Fence.

It will perhaps be objected, what Reaſons I am able to give for the *Incrementum* of the *Fœtus* from Time to Time, in ſuch a Manner, and in ſuch a Proportion, as I have aſſign'd here, ſince in Abortions of Four and more Months, we find them not to come up to that Magnitude which I have aſſign'd them here in a much ſhorter Time. I might, in anſwer to theſe Objectors, return with very good Reaſon, That ſince they cannot reſt ſatisfied with thoſe ocular Demonſtrations which are founded upon undoubted Experience, 'tis in vain to pretend to give any other Satisfaction upon this Head. But this

this Objection may eaſily be ſolved, by ſaying, That theſe Abortions have remained in the Womb for ſome time after they were dead; or if they were alive all that while, they were ſo infirm that they could not receive ſufficient Supply of Nouriſhment for their full Growth.

The Explanation of *Figure* I, II, III, IV, V, VI, VII, VIII, and IX.

Figure I. *repreſents Two Humane Eggs, of a different Bigneſs.*

Figure II. *repreſents an* Embryo *of Three, or at moſt of Five Days after Conception.*

A. Shews the interior Surface of the Membranes *Chorion* and *Amnion*, without any Signs of the *Hepar Uterinum.*

B. The *Embryo*, in which you may perceive a Diſtinction betwixt the Head and the Body, but not the leaſt Delineation of any of the other Parts.

Figure III. *offers to your View an* Embryo *of Fifteen Days.*

A. The *Hepar Uterinum*, through which are diſſeminated the ſmall Veins and Arteries.

B, B, B, B. The Membrane *Chorion*, diſſected into Four Parts.

C, C, C, C. The Membrane *Amnion*, diſſected into Four Parts.

D. The *Funiculus Propagationis.*

E. The *Embryo* of about Fifteen Days, in which ſome Parts of the Body appear already diſtinct in their Formation.

Figure IV. *repreſents to our View a cartilaginous Skeleton of a* Fœtus *of Three Weeks.*

Figure V. *gives us a Draught of a* Fœtus *of One Month.*

A. The whole Compages of the Head, which being cartilaginous, nevertheleſs ſhews its oſſeous *Puncta* in the *Maxillæ*, as well the inferior as ſuperior.

b. The *Clavicula* are already altogether oſſeous.

c, c. The *Puncta* of Oſſification in the *Scapulæ.*

d, d. The whitiſh Streaks or Lines which ſhew the Oſſification of the *Humerus.*

e, e. The white Lines, ſhewing the Oſſification of the *Cubitus* and of the *Radius.*

F, F. Theſe whitiſh *Punctula* ſhew the Beginning of Oſſification in all the Ribs, except in the firſt and laſt.

g, g. The *Oſſa Femoris* alſo diſcover what is oſſeous in them.

h, h. The *Focile Majus* and *Minus*, being both conſpicuous, and having ſomething by this Time (as we have obſerved ſince) that is of an oſſeous Subſtance.

Figure VI. *repreſents a* Fœtus *of Six Weeks. This* Fœtus *does not differ from that of Two Months, unleſs it be in its Magnitude; and that in this, the* Focile Minus *does appear, which we did not diſcover in the other.*

A. Gives us a ſeparated Delineation of the *Maxilla Inferior*, diſtinguiſhed into Six ſmall Bones.

Figure VII. *repreſents a* Fœtus *of Two Months, in its Firſt Beginning of Oſſification, which has been repreſented here ſomething larger than naturally it is; for though every Thing is diſtinctly to be ſeen in the Skeleton, (ſuch a One as I keep by me) yet ſ*

Fig: I

Fig: II

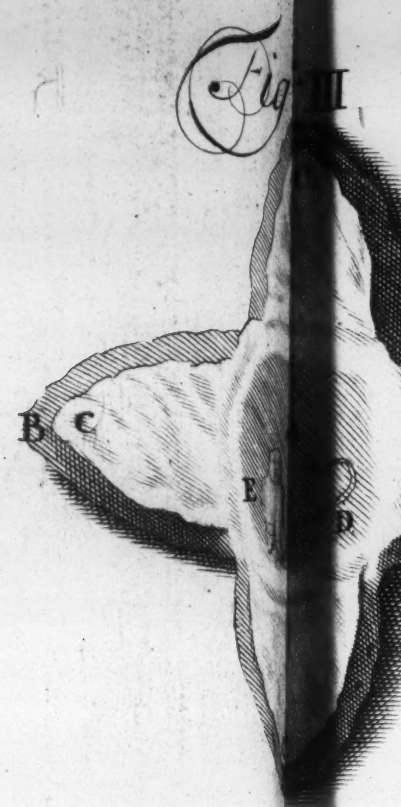


Fig: V

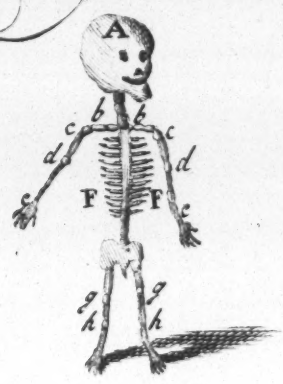


Fig: IV

Fig: VII

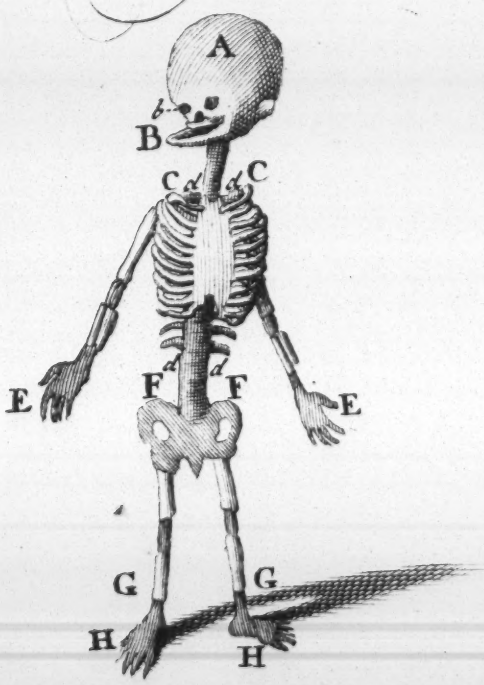
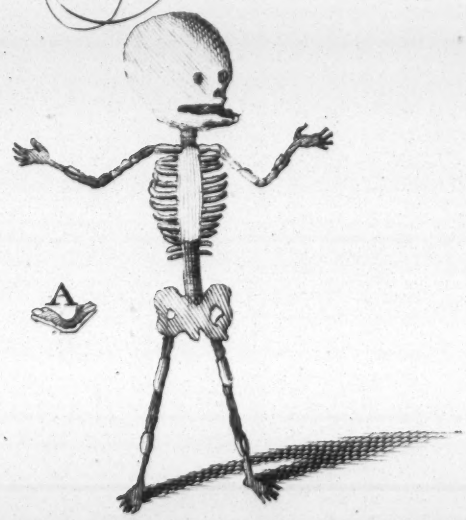


Fig: VI



Not. 4

Not. 5

Not. 6

This Cutt is taken out of Theodore Kerkeringy's

Fig: II

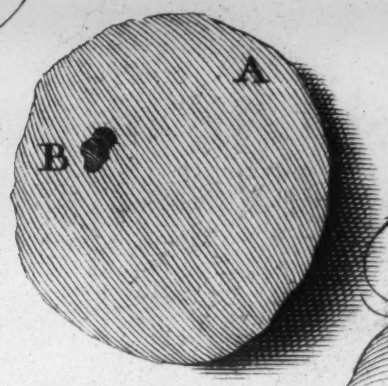


Fig: III

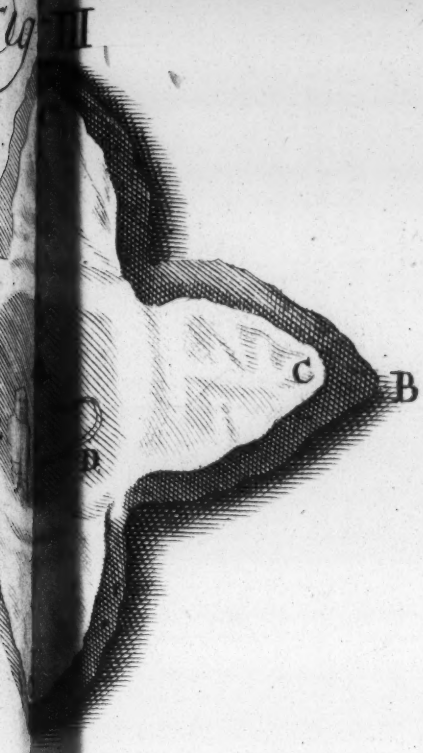


Fig: IX

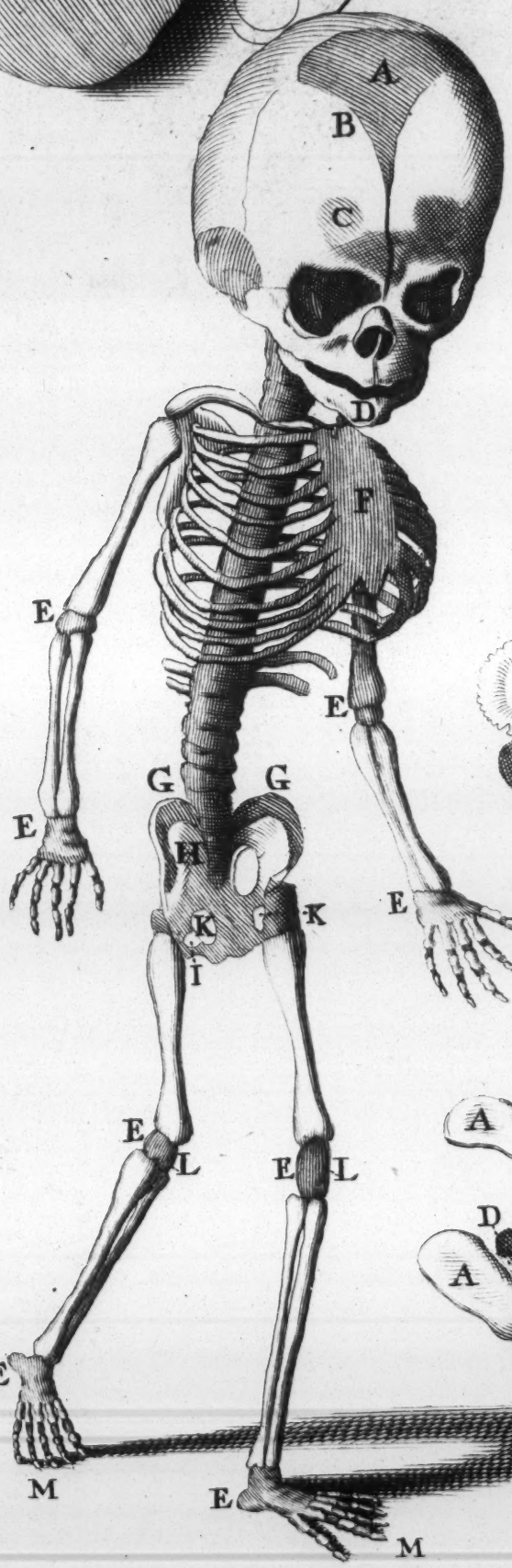
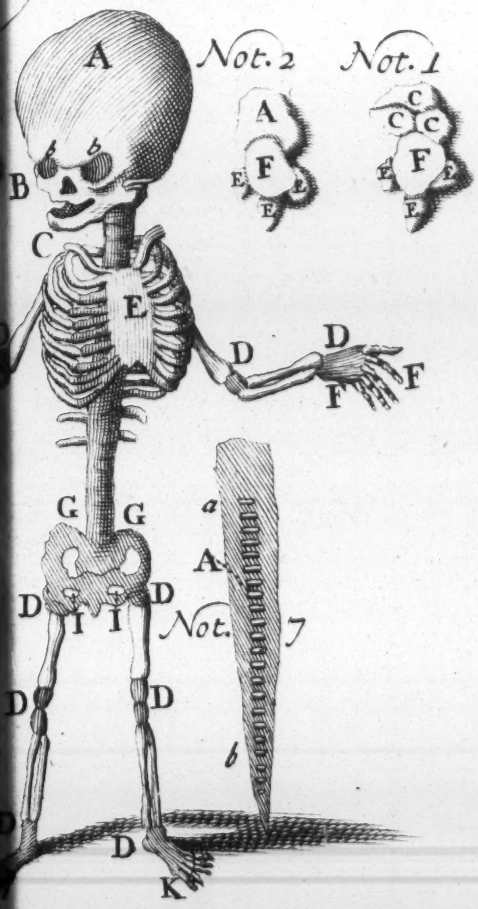
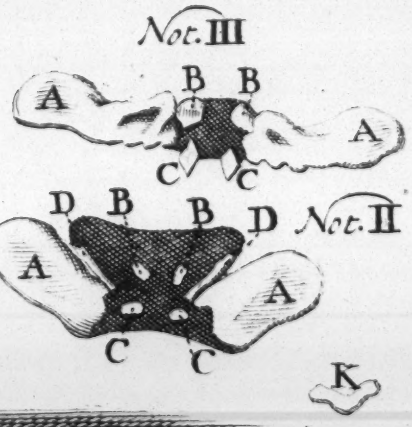


Fig: VIII





thropogenia Ichnographia, & his Osteogenia Fœtuum.

next to an Impoſſibility to expreſs them ſo plainly in a Figure, unleſs ſome Allowance were given for its Bigneſs.

The whole Compages of the Head cartilaginous.

The Third Pair of Bones belonging to the Upper-Jaw, their undigeſted Beginning of Oſſification.

The inferior *Maxilla*, already wholly oſſeous, and plainly diſtinct in its Middle.

C. The Two Clavicles, the firſt that are generated among all the Bones.

d, d, d. The upper and lowermoſt Ribs cartilaginous. All the reſt are already oſſeous.

E, E. The Hands altogether cartilaginous, in which appear Five Fiſſures, anſwerable to the Five Fingers, and in them certain *Puncta*, being the Principles of Oſſification.

F, F. The Cartilage of the *Os Innominatum*, in which are to be ſeen Two *Puncta* of Oſſification of the *Os Ilium*, ſtrictly ſo call'd.

G, G. The *Focile Majus*, near which there is not the leaſt Sign or Appearance of a Cartilage or oſſeous Subſtance of the *Focile Minus*.

H, H. The Feet wholly cartilaginous; as has been obſerved before of the Hands.

gure VIII. *repreſents a* Fœtus *of Three Months, with its Bones ſeparately from the Body.*

Repreſents the whole Capacity of the Head, being as yet for the greateſt Part cartilaginous.

b. The Beginning of Oſſification above the Orbit of the Eyes.

The Upper-Jaw, turn'd bony for the greateſt Part.

The Separation of the inferior Jaw-Bone in the Middle of the Chin.

D, &c. All the larger cartilaginous Articulations. The leſſer Ones are diſcernable by their Blackneſs in the Hands and the Fingers.

The *Sternum*, being all over cartilaginous.

F, F. The ſmall Bones of the *Metacarpus* and of the Fingers extended at Length.

G, G. The Cartilage of the *Os Innominatum*, in which there is nothing to be ſeen as yet that is oſſeous, excepting *h, h*, being the Firſt Beginnings of the *Os Ilium*, (in a ſtrict Senſe) which are now turn'd into a bony Subſtance.

I, I. Two *Foramina* in the Cartilage of the *Os Innominatum*, near that Place where the *Oſſa Pubis* and *Coxendicis* are to be formed.

K, K. The Articulations of the Feet, as they appear (but obſcurely) in the *Fœtus* about the Fourth Month.

ſmaller Figures mark'd with 1, 2, 3, 4. *repreſent the Variety there is of the great riangular Bone in the* Os Occipitis: *For ſometimes it conſiſts only of One Bone, as Note* 2, *the Letter* A; *ſometimes of Two, as Note* 3, *the Letters* B, B; *ſometimes of hree, as Note* 1, *Letters* C, C, C; *ſometimes of Four, as Note* 4, *Letters* D, D, D, D. *ut in all theſe mark'd with* E, E, E, *&c. they ſhew the ſmall Bones ſeparately from he triangular Bone, which afterwards are join'd together by Coalition.* F, *&c. ſhews* e Foramen *for the Paſſage of the Spinal Marrow.*

eſſer Figure *or* Note *mark'd with* (5.) *repreſents the Inferior* Maxilla, *divided into Four Parts.*

Its Diviſion in the Middle of the Chin.

Are the Proceſſes call'd *Corona*, into hich are inſerted the Tendons of the mporal Muſcles, which are the Heads the Bones, and till the Third Month are divided from the reſt of the *Maxilla* by their Suture. And that we might give you a more convenient View of theſe Bones, they are a little diſtorted beyond their natural Poſition.

Figure *or* Note (6.) *repreſents the* Scapulæ.

he *Summus Humerus*, or the *Scapulæ*.

The *Proceſſus Coracoides*. *c.* The Neck: ng altogether cartilaginous. *D.* The *Baſis*, being alſo for the greateſt Part cartilaginous.

Figure

Figure *or* Note (7.) *repreſents the Interior Part of the* Vertebræ.

A. A remarkable *Punctum* of Oſſification in the Sixth *Vertebra* of the Back, from whence aſcending to the Fifth *Vertebra* of the Neck, it is diminiſhed gradually.

a, b. Is the Third *Vertebra* of the *Os Sacrum*, unto which the Oſſification, (ſo as to diminiſh gradually) does deſcend in this Month.

Figure *or* Note (8.) *Shews the Exterior Part of the* Vertebræ.

A. The uppermoſt *Vertebra* of the Neck, from whence Nature deſcends in this Month to the *Os Sacrum*, ſo as to diminiſh the Oſſification all along gradually.

Figure IX. *Repreſents a* Fœtus *of Four Months, with its different Parts ſeparately.*

A. The *Fontanella.*

B. The Suture which divides the *Os Frontis.*

C, C. The Cartilaginoſity in the Center of the *Os Frontis.*

D. The Diviſion in the inferior *Maxilla.*

E, E, &c. All the large cartilaginous Articulations. The leſſer Ones in the Hands and Feet are conſpicuous by their Blackneſs.

F. The *Sternum*, as yet wholly cartilaginous.

G, G. The Cartilage which incloſes the *Os Ilii.*

H, H. The *Os Ilii*, ſo call'd in a ſtrict Senſe, and its Diviſion from the *Os Coxendicis*, (there being no *Os Pubis* as yet.)

I. The Left Side of the *Os Coxendicis*; for the Poſition of the Figure hinders the Proſpect of the Right Side.

K, K. The large *Foramina* in the *Os Pubis*, and in the Cartilage of the *Coxendix.*

L, L. The cartilaginous *Patella*, ſcarce diſcernable from the Cartilage belonging to the Articulation.

M, M. The Articulations of the Toes, of which there is no Appearance as yet in the middle Joints.

Note I. *Repreſents the* Os Temporum.

A. The *Os Squamoſum.*

B. The *Proceſſus Zygomaticus.*

C. The Membrane of the *Tympanum*, in its natural Poſition.

D. The bony Circle of the *Tympanum*, which encloſes the Membrane.

E. A ſmall oſſeous Line of the *Os Petroſum.*

F. The *Proceſſus Styloides*, being as yet cartilaginous, but diſtinguiſh'd from the reſt of the Cartilage in its natural Poſition.

G, G. The great Cartilaginoſity of the *Os Petroſum.*

Note II. *The* Os Sphenoides, *in its Interior Part, ſo as to make its Eight ſmall Bones to appear to our View.*

A, A. The Firſt Pair, the *Proceſſus Pterigoidei.*

B, B. The Second Pair, the Beginnings of theſe Proceſſes, which afterward touch the *Superior Maxilla.*

C, C. The Third Pair, the Principle of the Bone, which afterwards forms the *Sella Equina*, being now diſtinct ſmall Bones, about the Bigneſs of a large Pin's Head, which ſoon after are united by Coalition, and repreſent the Figure mark'd with *L.*

D, D. The Fourth Pair, the Beginnings of the Bone, through which paſs the Optick Nerves. The Two ſmall Lines are now oſſified.

For the reſt, the *Os Sphenoides* in this Month is nothing elſe but one continued Cartilage, which begins to be oſſified in ſeveral Places, where theſe beforeſaid Eight *Puncta* are plac'd.

Note III. *The Exterior Part of the* Os Sphenoides.

A, A, The Firſt Pair.

B, B. The Second Pair.

C, C. The Third Pair.

The Fourth Pair, deſign'd for the Tranſmiſſion of the Optick Nerves, is not diſcernable here.

The

THEODORE KERKERING's Osteogenia Fœtuum; or of the Generation of BONES in the *Fœtus*.

CHAP. I.

Of the MEMBRANES and CARTILAGES.

WHAT *Laurentius* has very well obſerved concerning the *Os Syncipitis*, *viz.* That in an Infant it is membranous; That after that it becomes a Cartilage; and in adult Perſons turns into a Bone; muſt not be applied to that Bone only, but alſo takes Place in relation to divers other Parts of the Body; it having been found by frequent Experience, that moſt of thoſe Parts that are commonly ſaid to be cartilaginous, are originally membranous, and that by little and little they acquire the Conſiſtency of a Cartilage, before they arrive to the Solidity of a Bone. This is ſo very apparent (beſides many other Places) in the *Fontanella*, or Aperture of the Head, as alſo in that Conjunction which is ſo viſible in the Bones of the *Maxilla Inferior*, or Lower Jaw-Bone, in the *Mentum* or Chin, that to contradict ſo manifeſt a Truth, would be to contradict that the Sun is light: So that, it being our preſent Purpoſe to trace the very Origin and Firſt Principles of the Bones of a *Fœtus*, (as far as is poſſible) it will perhaps be judged requiſite for us, not only to make an exact Difference and Diſtinction of thoſe different Times when theſe Membranes begin to be changed into Cartilages; but alſo to enter upon a nice Scrutiny of the Terms made uſe of by the Authors, who (for Inſtance) have call'd this before-mentioned Conjunction of the Bones in the *Mentum*, for the moſt Part a *Synchondroſis*; whereas if we would inſiſt upon Criticiſms, it ought to be ſaid, that this Connexion was firſt of all made by a *Syneuroſis*, which afterward is changed into a *Synchondroſis*. But conſidering that in this Tranſmigration of the Membranes into Cartilages, Nature takes ſuch hidden Steps, as are undiſcoverable to the Eyes even of the moſt quick-ſighted Men in the World, *viz.* where, and much leſs when this Tranſmutation is performed, I judged it moſt proper to leave that Point altogether undecided, and not only to reſt contented with the *Terms* the Authors have given them, (without making any Diſtinction betwixt them) but alſo conſtantly to follow their Footſteps, and make uſe of the ſame Expreſſions in our following Tract; ſo that moſt of thoſe Things that are to be mention'd under the Name of *Cartilages*, muſt be taken to have been before, and many of them ſtill to continue to be nothing but Membranes, notwithſtanding they are both by us and by others comprehended under the Word *Cartilage*.

CHAP. II.

Of the OS FRONTIS.

CONcerning the different Times and Degrees of the Encreaſe and Oſſification of the Bones, I lay this down for a general Obſervation, That there appearing ſcarce any Thing of an oſſeous Nature during the firſt Two Months, it will be ſufficient to begin with the Third Month after Conception, yet ſo, that in caſe any thing occurs where Nature has progenerated a bony Subſtance before that Time, the ſame ſhall not be paſs'd by in Silence, but be remember'd in its due Place.

In the *Os Frontis* there appears nothing else during the First Two Months but either a Membrane or a Cartilage; for, as I told you just now, I shall not pretend to be very scrupulous in making any Difference betwixt them. It seems as if Nature, in the Composition of the Fabrick of our Body, intended first of all to draw a Kind of cartilaginous rough Draught or Model, which by reason of its Softness it might alter and bring by degrees to its Perfection. Thus, if we rightly trace her Steps, we shall see her bring these tender Parts by degrees to the Solidity of Bones, not by consolidating the whole at once, but by introducing an Ossification by little and little, and as it were not without some Caution, till by degrees it brings the Body to a compleat and a well-fram'd Solidity. But it is time we should come to the Third Month, when in the Orbit of the Eyes there appear as it were through a Mist certain Points, being the Centers of those Bones that are to be form'd there. But above this Orbit is to be seen a semilunar osseous Substance, which (contrary to what is observed in the other Bones, that dilate themselves from the Center to their Circumference) expands its self in its Circumference to the *Os Syncipitis*, the middle Part remaining cartilaginous.

In the Fourth Month, this Substance is for the most Part already turn'd into a Bone, except that a little below its middle Part there still remains a certain Portion of the Cartilage, and another is perceiveable also near the *Os Sphænoides* and the *Temporal Bones*.

This Ossification encreases, as we told you before, towards the *Os Syncipitis*, and extends it self towards the *Fontanella* of the Head, which at that Time still takes up a great Part of the *Cranium*. During this same (Fourth) Month, begin also to appear the First Tracts or Impressions of that Furrow through which the Third Pair of Nerves passes above the Eyes, after it is (as generally it does) form'd into a *Foramen*. Above the Nose you may also plainly distinguish a certain harmonical Connexion, which is somewhat more laxe towards the *Fontanella*. These osseous Points, which appear'd in the Third Month as it were through a Mist only in the Orbit of the Eyes, now begin to shew themselves much more clear.

In the Fifth and Sixth Month, as the Ossification encreases, the *Fontanella* decreases; and, besides that, by this Time the whole Orbit of the Eyes is become osseous, the central Cartilaginosity of the Bone is scarce to be seen any more, and in the Seventh Month leaves not the least Sign of it in the Substance of the Bone.

In the Eighth Month you may plainly discover, through the Aperture of the *Fontanella*, the adjoining longitudinal *Sinus*: But the *Suture* of this Bone is closed up after the Child is born, unless it continues open during the whole Course of a Mans Life; which does not happen so seldom as some have been apt to imagine, because I my self have seen no less than Ten several Instances where they did continue till the Persons came to a very advanced Age.

In the Ninth Month all the Bones, but more especially the *Os Frontis* and *Occipitis*, are joined or closed together, by the Means of very soft, broad, loose, and flaccid Connexions and Sutures, which contribute much towards the facilitating of Parturition; because the Head being thereby render'd more pliable, is apt to admit of a Compression during the Time of Parturition, to facilitate its Eruption, there being no such Thing as any Opening or Disunion in the *Ossa Pubis* during the Woman's being in Labour, nor any Reunion or Recoalition of those Bones after her Delivery, as some have vainly imagined. The Aperture of the *Fontanella* is more toward the *Os Frontis* than the *Os Occipitis*: Whence *Aristotle* calls it the last Bone; which must be explained of its being brought to its full and final Perfection, it being otherwise to be reckon'd among the First Bones of the *Cranium*.

CHAP

CHAP. III.
The OSSA SYNCIPITIS.

THE *Ossa Sincipitis*, which during the First three Months discover'd themselves only by some darkish Points, without any thing else that had any Resemblance to the Nature of Bones, are immediately after the Fourth Month altogether turn'd bony. Thus we see Nature to make all possible Speed for the Defence of the Seat of the *Animal Faculty* and of *Wisdom*. At the same Time, at the *Sutura Sagittalis*, the *Ossa Sphænoides* and *Temporum*, and the *Fontanella*, are still to be observed at a good Distance by cartilaginous Apertures.

These are turn'd into an osseous Substance, by beginning at the Middle, and not at the Circumference, as we told you before, that it was observable in the *Os Frontis*, quite contrary to what was usually to be seen in other Bones.

In the Fifth and Sixth Month they encrease notably, and their *Sutures* become so streight by little and little, that in the Seventh Month they are already closely join'd together by an *Harmony*: Notwithstanding which, there still remains a notable Aperture, but covered with a Membrane betwixt them and the *Ossa Sphænoides* and *Temporum*, which however is scarce discernable in the Eighth, and quite disappears in the Ninth Month. But the *Fontanella* being plac'd partly within these Bones, but more still within the *Os Frontis*, is not closed up till Nine or Ten Months after the Child is born; nay, sometimes it keeps open in Children till they come to the Fourth or Fifth Year of Age, and in some Men to a very old Age.

Neither ought we in this Place to pass by in Silence what is most frequently observed by the Midwives, who lay this down as a Rule, founded upon their own Experience, that the Child has been living, if they find the Membrane of the *Fontanella*, which before was extended by the vital Motion and Spirit of the *Cerebrum*, to be turn'd flaccid.

CHAP. IV.
The OS OCCIPITIS.

Oiterus and *Spigelius* have taken Notice of Four several Bones belonging to the *Os Occipitis*; the latter of which expresses himself in these Words: *The First is the great Triangular Bone where the* Sutura Lambdoides *in adult Persons ends in Two Divarications, and the Additaments of the* Sutura Lamdoides *have their Beginnings. It is circumscribed by a very laxe* Rima *or Aperture, passing in a transverse Line from one Extremity of the Divarication of this* Sutura *to the other, and is divided by it from the other Three Bones, Two whereof contain the* Capitula *of the* Occiput, *call'd otherwise* (by Galen) *the* Coronæ, *unto which are join'd the First* Vertebræ *of the Neck. The Third, or rather the Fourth Part of the* Occiput, *is that which by Way of an Additament is join'd with the* Os Sphænoides. He has expres'd himself excellently well concerning these Four Bones; but at the same time I desire my Reader to observe with me, (which has not been done by any one before) how Nature does sometimes sport in the Generation of this great triangular Bone, whereof he has given us his Description, *viz.* How the same in the Third Month after Conception is composed oftentimes of Four, still oftner of Three, and sometimes also of Two, or One single Bone, all which, by the Expiration of the said Third Month, are join'd by Coalition in that One Bone describ'd by *Spigelius*. Besides which, there is another Observation concerning this Bone, which ought not to be pass'd by in Silence, no more than the former, in this *Osteogeny* of the Bones, (though the same has been omitted

by thoſe that have confin'd themſelves only to the *Oſteology* of adult Perſons) *viz.* That after this Coalition is accompliſhed, there grows on this Bone another ſmall *triangular* and *tricuſpidal* Bone, having the Shape of a perfect Triangle. With one of its Points it touches the triangular Bone juſt now mention'd, and extends the other Two towards the *Coronæ*, which it moſt commonly touches alſo in the Eighth Month; and in the Ninth (unleſs when Nature deviates from the common Road) is join'd by Coalition with them, as alſo with the ſo often mentioned triangular Bone. That Bone which is under the *Coronæ* does alſo grow in a tricuſpidal Figure, Two Points whereof do each extend to the *Coronæ*, *viz.* One to each of them, and the Third toward the *Os Sphænoides*; yet ſo, as that it is never joined with the *Os Sphænoides*, but is united with the others (which are by this Time already reduced to Three by Coalition) after the Child is born. In the *Os Occipitis*, Nature ſeems not to have confined her ſelf to any certain Rules, there being ſcarce any other Part wherein ſhe ſports and varies ſo much as in this. At this very Time I have and keep by me ſeveral Heads of Nine Months, for the Satisfaction and Contemplation of the Curious, where this great triangular Bone is divided into Four irregular Parts, beſides ſeveral other Irregularities that may be obſerved in them.

CHAP. V.

OSSA TEMPORUM, or TEMPORAL BONES.

THE Anatomiſts moſt commonly diſtinguiſt the *Oſſa Temporum* into Two Parts, one whereof they call the *Os Petroſum*, and the other the *Squamoſum*: But ſeeing it is not ſo much our Scope to treat of thoſe Bones that are already made and join'd together as they are in adult Perſons, but to examine how they are fram'd, and out of how many Bones they are join'd together in a *Fœtus*, we are obliged to proceed in a different Method, and gradually, as we have done heretofore.

And conſidering that here alſo there is nothing to be ſeen in the Second Month but a bare Cartilage, we will proceed immediately to the Third. Then it is, that the *Proceſſus Zygomaticus*, together with the Proceſs of the Firſt Bone of the *Maxilla Superior*, forms the *Os Jugale*, or the *Zygoma*, altogether oſſeous; but for the reſt, in the cartilaginous Part, there is nothing to be ſeen as yet that has the leaſt Reſemblance to an oſſeous Subſtance, excepting that Circle in the *Os Petroſum* unto which is annexed the Membrane of the *Tympanum*, which appears ſcarce to be of a Hair's Breadth. But becauſe the *Meatus Auditorius* remains cartilaginous all the Time of the Woman's being with Child, we cannot ſufficiently admire the Providence of Nature in the forming of this Part, which has not been taken Notice of by any one hitherto. The *Tympanum* and its Membrane being the Inſtruments of Hearing, their Preſervation was doubtleſs of the greateſt Conſequence to Mankind. 'Twas upon this Account that the great Architect of our humane Fabrick thought fit in his Wiſdom to ſtrengthen this thin Membrane of the *Tympanum*, by the Addition of another thicker One, which might defend it againſt any Accidents, till the *Meatus Auditorius* did acquire ſufficient Solidity and Strength to protect it againſt any external Injuries. Hence it is, that this Membrane, which it is impoſſible to divide from the Membrane of the *Tympanum* at this Time, may be ſeparated from it afterward. To verify this Aſſertion, I keep by me this Membrane ſeparated from the Membrane of of the *Tympanum* in ſuch a Manner, that its Extremities remain coherent to it.

In this Third Month alſo begins to appear the *Proceſſus Styloides*, not in an *oſſeous* Subſtance, and extended like a *Spina*, but like a ruddy Cartilage of an oblong Figure, plac'd upon the before-mention'd oſſeous Circle, where it has its Riſe on that Side, and not is turn'd into a bony Subſtance till a good while after the Child is born.

In

In the **Fourth Month** 'tis almoſt ſurprizing to behold in how ſhort a Time a great Part of the *Os Squamoſum* is already become oſſeous, and that to ſuch a Degree of Perfection. By this Time alſo the *Os Petroſum*, by its ruddy Cartilage, has circumſcribed the Form of its Concavity, which is to contain the Organs of Hearing; though it has as yet nothing that bears any Reſemblance to a Bone, excepting one pretty broad and unequal Line, plac'd under the before-mention'd Circle or Ring, but extending in Length a little beyond it; ſo that the *Os Temporum* in the Third Month conſiſts of Three ſmall Bones, *viz.* the *Annulus*, the *Os Squamoſum*, and that laſt mention'd.

In the Fifth Month the *Os Squamoſum* is already encreaſed ſo far, as to approach very near to the *Os Syncipitis*, and touches the *Os Cuneiforme*. That Part of the *Os Petroſum* which forms the *Proceſſus Mamillaris* is now alſo augmented by the Addition of Three other ſmall Bones; One of which, made like a Pear, with its pointed Part is annexed to the *Squamoſum*; the Second approaching in its Magnitude to the *Scutum Ovale*, and being of the ſame Bigneſs with the former, is divided from it by an intermedious Cartilage, as the Third is from both, though not comparab'e to either of them in its Magnitude, being ſcarce of the Bigneſs of a large Pin's Head. They are plac'd in the ſame Order and Poſition as they are repreſented in the Figure of a *Fœtus* of Five Months; unto which I refer the Reader. And upon this Occaſion it is not only worth our Obſervation, but alſo our Admiration, what *Veſlingius* looks upon as an almoſt ſtupendious Effect of Nature in the Ninth Month, *viz.* That the *Tympanum*, the *Labyrinthus*, and the *Cochlea*, are improved to ſuch a Degree in One Month's Time, that not only in their oſſeous Subſtance, but alſo in their Magnitude and Symmetry, they come very near to their natural Perfection. Near that Perforation which affords a free Paſſage to the *Nervus Auditorius*, is to be ſeen another *Foramen*, which is round alſo, and not much bigger than the former. This in abult Perſons leaves a certain Impreſſion or Tract, but ſomewhat narrower and longiſh; but its Uſe is ſo far from having been diſcover'd hitherto, that it has not ſo much as been mentioned by any Body, as far as I know. I muſt not forget to put you in mind alſo, that this whole Bone we now are treating of, is much more rough and unequal in a *Fœtus* than in adult Perſons.

And now thoſe ſmall Bones that are the Organs of Hearing begin to offer themſelves to our Sight, being already encloſed and formed in their proper Concavity. For the *Malleus* being now become oſſeous, adheres ſtill to the cartilaginous Membrane of the *Tympanum* with its oblong Proceſs: And the *Incus* having by this Time acquired its natural Figure, has nothing that is cartilaginous except its final Proceſs. The *Baſis* as well as the Divarications of the *Stapes* are altogether oſſeous; but on the upper Part reſembles rather unto a Semicircle than to an *Iſoſceles*, as it does afterwards. *Bartholin* mentions a Fourth Bone here, which he ſays was ſhewn him by *Frances Sylvius*, and that it is to be met with in adult Perſons. I remember I have found ſuch a one in a Calf's Head; but if it is extant in Men, I am ſure it is not ſo in a *Fœtus*. The *Os Temporum* therefore in this Fifth Month is compoſed of Six different ſmall Bones, *viz.* the *Os Squamoſum*, the *Annulus*, the Bone which forms the interior Cavity, and the other Three which we told you are become Bones in this Month.

In the Sixth Month, the *Os Pyriforme* and the *Scutiforme* are united in one by Coalition, and the Third is become ſomewhat bigger. The *Stapes* is not as yet arrived to its natural Shape. The *Malleolus* and *Incus* are a little encreaſed in Magnitude, but have not in the leaſt changed their Subſtance.

In the Seventh Month, the Third ſmall Bone is join'd to thoſe Two which we told you were united together by Coalition in the preceding Month. By this Time the *Malleus*, *Stapes*, and *Incus*, are arrived to ſuch a Degree of Perfection, that in their Subſtance, Solidity, Figure, and Magnitude, they differ very little from the ſame Organs of Hearing which are to be ſeen in adult Perſons. I had almoſt forgot to tell you, that the oblong Proceſs of the *Malleolus*, by which it is join'd to the *Tympanum*, does ſtill diſcover at its Extremity ſomething like a cartilaginous Subſtance, which nevertheleſs diſappears ſoon after. I judge I need add nothing

nothing concerning the Eighth and Ninth Months, unleſs it be to inform you, that even then the *Fœtus* is as yet deſtitute of the *Proceſſus Mamillaris*, and that the *Os Petrosum* is ſtill divided by a pretty large Cartilage from the *Oſſa Occipitis & Syncipitis.*

CHAP. VI.

The OS SPHÆNOIDES.

THE *Os Sphenoides* is like almoſt all the other Bones, altogether cartilaginous till the End of the Second Month; ſo that it rather ought to be call'd the *Materia* of the Bone than the Bone it ſelf.

Upon this Occaſion I cannot forbear to mention, That *Laurentius* has given us a Delineation of a *Fœtus*, which, as he tells us, was ſcarce of a Month or Thirty Days after Conception; in which are repreſented the *Fontanella*, and almoſt all the other Bones, in the ſame Magnitude as thoſe of a *Fœtus* of Six Months after Conception. If this Gentleman did not give us this Figure upon Hearſay, but upon his own Experience, this *Fœtus* muſt be reckon'd among the monſtrous Ones. But I am rather inclined to believe, That this Gentleman having perhaps had but little Opportunity of examining the *Fœtus's* of different Ages, was impoſed upon by the Mother or Midwife, who put upon him a *Fœtus* of ſome Months Growth inſtead of an *Embryo* of a Month; becauſe, during the Firſt, and the greateſt Part alſo of the Second Month, the whole *Fœtus* is cartilaginous; in which you ſee nothing but ſome rude undigeſted Signs or Tracts of the Bones to be formed afterward.

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In the Third Month, there begins to appear ſome ſlender Portion of the *Proceſſus Pterygoidei* below the *Os Zygomaticum*; and this being the only Thing to be obſerved here in the Third Month, that has any Reſemblance to a Bone, the *Os Sphænoides* may be ſaid to conſiſt then of Two Bones.

In the Fourth Month, this Bone is compoſed of Eight, or rather of Four Pair of Bones: For the better underſtanding whereof, I will refer my Reader to the Figure repreſenting a *Fœtus* of Four Months. The Firſt are the juſt now mention'd *Proceſſus Pterygoidei*, mark'd on each Side with the Letters *A*, *A*. being conſiderably encreaſed by this Time. The Second Pair are Two Proceſſes mark'd with *B*, *B*. which touching the Fifth Pair of the *Maxilla Superior*, do as it were ſupport it, being there ſeparated from each other by the *Vomer*, that is plac'd betwixt them. The Third Pair are Two Bones, *C*, *C*. which are afterward to form the *Sella Equina*, and begin to appear in this Month, but exceed not in Bigneſs the Head of a large Pin, and are ſeparated both from each other and from all the reſt; but before the Concluſion of the Fourth Month, are united by an oſſeous Subſtance, which ſhapes them into a ſemilunar Form; which I happen'd once to diſcover Fourteen Days before the Fourth Month was expir'd. The Fourth Pair are the Proceſſes *D*, *D*. deſign'd for the Reception of the Optick Nerves; which being as yet deſtitute of thoſe Perforations through which theſe Nerves are to paſs, appear now only like Two thickiſh ſmall Bones extended lengthways.

In the Fifth Month, this *Os Sphænoides*, which but ſo lately was divided into Eight Parts, is already become One Bone. Neither is that ſmall Line or Streak plac'd betwixt the *Proceſſus Pterygoidei* and the Bones that make the *Sella Equina*, of ſufficient Conſequence to queſtion this their Coalition, no more than that Cartilage which is in the Middle of the *Sella Equina*; for this does not multiply the Number of the Bones, becauſe they are all join'd together at the Edges of this cartilaginous Interſtice. 'Tis not for my Purpoſe here to enlarge my ſelf, or to enter upon a Refutation of the Opinions and Arguments of others, being fully convinc'd, that all their Arguments cannot ſtand in Oppoſition to our ocular Experience.

In the Sixth and ſucceeding Months, to the Ninth, this Bone encreaſes, and becomes ſtronger by little and little; as on the other Hand, the Cartilages which were betwixt it

Branches

Branches, and ſeem'd to divide this Bone, (as ſome would have it) not only are diminiſh'd by degrees, but alſo at laſt quite diſappear; ſo that now they are altogether united in One Bone, beyond all Contradiction, as in Effect they were even before at the Sixth Month: For as a Tree is call'd a Tree, though its Branches, which are join'd to the Trunk, are ſpread into divers Parts; ſo by the Sixth Month the *Os Sphænoides* may properly be call'd One Bone, becauſe not any one of its Parts is quite diſjointed from the reſt, but are all united together in one, though divided into ſeveral Branches by the Means of the Cartilages.

And here I cannot paſs by in Silence, That *Spigelius*, after *Fallopius*, as likewiſe *Coiterus*, enumerates no more than Four Bones in the *Os Sphænoides*; and the Firſt tells us, That they are ſcarce diſcernable till after the Seventh Month of the *Fœtus*: And *Riolan* agrees with them as to this Number; but with *Eyſſonius* makes the *Alæ* and the *Sella Equina* but one and the ſame Bone, to make up the exact Number of Four.

I cannot well imagine, what could make all theſe Anatomiſts to deviate ſo far from the true Path: For there are certainly Eight ſmall Bones belonging to the *Os Sphænoides*, which are plainly to be ſeen in the Fourth Month; and, as I told you before, divided into Four Pair, which afterward are united by Coalition into One Bone long before the Infant is born. I am apt to believe they were not ſo exact as they ought to have been in diſtinguiſhing the different Times of the *Fœtus* that came under their Hands; and one relying upon the Authority of the other, and willing to reconcile his Opinion with the others, have introduced this Confuſion in the Hiſtory of the *Os Sphænoides*; which I have here repreſented in a plain and diſtinct Method, and cauſed the Figure thereof to be engraven after thoſe Bones I ſtill keep by me for the Verification of my Aſſertion; in which I have taken more than ordinary Pains; for I was obliged to break to pieces divers Heads of a *Fœtus*, (which I could willingly have kept entire) in order to inveſtigate with all poſſible Exactneſs the true Poſition of this Bone in the Middle, and that through the Courſe of each Month; being reſolved not to recede from and declare againſt the Aſſertions of ſo many Anatomiſts, without making my own reiterated Experience the Foundation-Stone of my Aſſertion.

CHAP. VII.

The OS ETHMOIDES.

THE *Os Ethmoides*, or *Cribriforme*, is not altogether cartilaginous in a *Fœtus*, much leſs in Children, as *Coiterus* and *Riolan* ſay it is: Nor does it conſiſt of Three bony Parts, as *Eyſſonius* will have it; for the *Septum* that divides the Cavity of the Noſe is never of a bony Subſtance in a *Fœtus*, no more than the *Criſta Galli*, nor that Table which is perforated like a Sive, which has imparted its Name to the whole Bone, but all that appears to be of an oſſeous Nature in the *Fœtus*, in this Bone, in the Fifth Month, are the ſmall ſpongeous Bones that adhere on both Sides to the *Septum*, and the Two *Laminæ* which make up Part of the Orbit of the Eye. In the Sixth Month, all the other Parts of this Bone being and remaining cartilaginous in a *Fœtus* even for a conſiderable Time after its Birth, it would be ſuperfluous to detain the Reader with any further Deſcription about them; the Difference of this Bone in a *Fœtus* and adult Perſons being ſufficiently remarkable in this, that neither the *Criſta Galli*, nor the *Septum Tranſverſum*, nor the immediate Organ of Olfaction, are of a bony Subſtance.

CHAP.

CHAP. VIII.
Of the UPPER JAW-BONE.

THE Upper Jaw-Bone conſiſts of no leſs than Eleven Bones, *viz.* Five on each Side, and One Single, call'd the *Vomer*, or like a Plough-ſhare.

The *Firſt* Pair are the Bones which, being almoſt of a triangular Figure, form the lower Part of the Orbit of the Eyes, the leſſer Angle, and Part of the *Os Mali*, and of the *Os Jugale*. The Second Pair are thoſe that form the great *Canthus*, and have a Perforation reaching quite within the Noſtrils. They are tranſparent, very thin, and the ſmalleſt of all the Bones belonging to the *Maxilla*. The Third, being the largeſt Bones of all, form the Palate, contain the Teeth, and make the lower Part of the Orbit. The *Fourth* are thoſe that form the Protuberancy of the Noſe, unto which are faſten'd the Cartilages of the Noſe. The *Fifth* are ſeated at the poſterior Part of the Noſe, where the Noſe has its Perforations towards the Throat. Unto theſe Five Pair we muſt add the Eleventh, call'd the *Vomeriforme*, from its Reſemblance to a Plough-ſhare, which divides the Noſe in the Nature of a Partition.

In the Second Month, all theſe Bones retain as yet their cartilaginous Nature, unleſs it be the Third Pair, which begin to be ſomewhat oſſeous.

In the Third Month, that Part of the Firſt Pair which, in Conjunction with the tranſverſe Proceſs of the *Oſſa Temporum*, forms the *Zygoma*, is already turn'd into Bone: And in the ſame Pair you may alſo perceive ſomething like a Bone at the Orbit of the Eyes. The Third Pair is now become altogether oſſeous; but has not as yet the leaſt Reſemblance to that Figure which it appears in afterwards: So that theſe Words of *Eyſſonius*; *The Bones of the Upper-Jaw in Infants differ either not at all, or at leaſt very little, from thoſe of adult Perſons*; muſt not be underſtood of a *Fœtus* of Three Months. The Fifth Pair begins now to ſhew a very ſlender long Line; and the *Vomer* is become oſſeous in that Part where it is join'd with the *Sphænoides*, and encreaſes gradually in the following Months.

In the Fourth Month, the Firſt Pair becomes altogether bony; but is ſtill divided from the *Os Frontis* by a pretty large Interſtice. The Second Pair, or the *Os Lacrymale*, is ſcarce diſcernable. The Third does not as yet come near to thoſe of adult Perſons, in reſpect of its Figure. The Fourth repreſents the Bones of the Noſe in their Figure and Proportion, yet not without ſome Difference in ſeveral Subjects, which is more obvious in adult Perſons, where we may obſerve a conſiderable Difference in this Frontiſpiece of the Face of Men. The Fifth Pair has alſo its Figure and due Proportion: And thus they encreaſe gradually all the ſucceeding Months, to the Ninth, when being brought to their Perfection, the whole Bone has then obtained the ſame Figure in all Reſpects with that in adult Perſons.

CHAP. IX.
Of the LOWER JAW-BONE.

AMong the Bones of the Head that are very forward in their Generation, we may number alſo that of the Lower-Jaw, which even in the Second Month begins to be of an oſſeous Subſtance. But what is moſt ſurprizing is its Figure, it being ſuch as I know not what to compare it to: For it conſiſts of Two ſmall Bones, which terminate below the Noſe in a ſharp Point, and that ſo far beyond the Bone of the Upper-Jaw, that nothing ſeems more unlikely than its being to be framed afterward into the Shape of the Chin of a Man. Nevertheleſs, as the Head encreaſes in Bigneſs, and the

Oſſa

Oſſa Temporum begin by degrees to divaricate themſelves, unto which the Bones adhere by one of their Proceſſes, call'd *Condylus*. This pointed Protenſion diminiſhes, till it does ſcarce ſtand out beyond the Upper Jaw-Bone. The other Proceſs, (for there are Two on each Side) call'd *Corone*, which has the Tendon of the Temporal Muſcle inſerted into it, is till the Third Month a ſmall Bone, divided from the other Part of the *Maxilla* by a Suture, which deſcending from thence to the *Alveoli* of the Teeth, terminates in a ſharp Point.

And here it is to be obſerved, That theſe minute Parts are much better and plainer to be ſeen in a Skeleton that is but lately ſet up, than in one that has been kept for ſome Months, becauſe they are apt to be changed, or perhaps quite diſappear, when the intermediate Cartilage or Membrane, (for it is hard to determine which of the Two it is) coming to be expoſed to the Air, will become hard, and ſeem to be of an oſſeous Subſtance.

But to return to the *Inferior Maxilla*, it conſiſts till the Third Month of Four Bones, Two of which are join'd in the Middle of the Chin by a *Synchondroſis* (as it is commonly call'd); and the other Two, mention'd juſt now, are united by a certain tranſparent Subſtance, which I believe to be neither nervous nor cartilaginous, but membranous.

Eyſſonius gives us an Inſtance of a certain Separation of the Bone in each of the *Inferior Maxillæ*, to wit, 'About the Middle 'of each of theſe Bones, where it has a 'thickiſh Protuberancy, (ſays he) and be'gins to be broader, there appear'd a *Fiſſura*, 'or Diviſion, which was coherent partly 'by an *Harmonia*, partly by a *Squamoſe* Su'ture, but ſo ſlightly, that upon the Firſt 'Touch, when I was cleanſing the Bones, 'they fell aſunder in the Left *Maxilla*, 'which made me imagine at Firſt Sight, 'that I had broken the Subſtance of the 'tender Bone: But when I began to adapt 'one of the Bones to the other, and at the 'ſame Time obſerved in the ſame Place, in 'the Bone of the oppoſite Side, juſt ſuch 'another ſlight Coheſion, which was eaſy 'to be divided, but not as yet ſeparated, I 'had not the leaſt Reaſon to ſuſpect this to 'be a violent Fracture, but a peculiar Fiſ'ſure.

But it is to be obſerved, That this Fiſſure being found only in one *Fœtus*, is not applicable to all. I am very apt to believe, that ſuch-like a Diviſion may be met with ſometimes: And I my ſelf keep by me the Head of a *Fœtus* of Nine Months old, where ſuch a Separation is to be ſeen in the *Maxilla*, beſides ſeveral other monſtrous Bones; but no Inference is to be made from thence to all the reſt. In the Seventh, Eighth, and Ninth Months, you may obſerve alſo, as well in this Bone as in that of the Upper *Maxilla*, certain tumourous Prominencies, which appearing much more plain now than in adult Perſons, ſeem to be nothing elſe but the *Alveoli* of the Teeth, which firſt appearing with Protuberancies on the Outſide, do afterwards, when the Bone acquires a greater Thickneſs in the other Parts, not ſtick out ſo much, and conſequently are not ſo eaſily to be ſeen. As for the Four *Foramina* through which this Bone gives an Ingreſs and Egreſs to the Vein and Artery, and the Nerve of the Fourth Pair, they are ſo very ſlender, even in the Ninth Month, that were it not that we know the Places of them in adult Perſons, we ſhould ſcarce be able to diſcover in a *Fœtus* the Places where they have their Paſſages.

CHAP X.
Of the TEETH.

I Have ſcarce any thing to ſay of the Teeth in particular, that may be judged worth our Obſervation; for Nature does ſo frequently and ſo variouſly ſport in the Formation of the Teeth, that to inſiſt upon every minute Matter of this Nature, would be to undertake an endleſs Task. I am certain there is nothing of this Kind in a *Fœtus*, which either for its Novelty, or its Variety in Reference to adult Perſons, can invite

the Curioſity of the Reader. For to tell you, that all the *Fœtus's* have no Teeth, and that they differ in that Reſpect alſo from Adults, is as much as to tell you, that a *Fœtus* was never known to be ſo big as a full grown Perſon: And yet there are not wanting Inſtances in the *Roman* Hiſtory, of ſuch as have been born with Teeth; and I my ſelf have by my own Experience found Teeth ſome Time before its Birth: An Account of which I have inſerted in the Firſt Century of my Obſervations, in the 24th Obſervation; and therefore judge it needleſs to repeat it here. It would be no leſs ſuperfluous to tell you, that in a *Fœtus* there are not to be ſeen all the *Alveoli* of all the Teeth; ſince we know, that in adult Perſons certain Teeth, call'd the *Dentes Sapientiæ*, do grow, (for they are not extant at firſt) and make their Appearance not till many Years after. Wherefore, without inſiſting any further upon the Hiſtory of the Teeth in a *Fœtus*, I will proceed to the Account of the Bones of the Trunk of the Body.

CHAP. XI.
The OS HYOIDES.

THE *Os Hyoides*, or *Ypſiloides*, has not been treated of by *Galen*; and there being not the leaſt Sign of it, nay, not ſo much as a Cartilage, to be met with in the *Fœtus*, I ſuppoſe we may eaſily obtain the Reader's Pardon, if we content our ſelves only with mentioning it. Perhaps it will be objected, that this Bone having no Articulation with any other Bones, it ought to be the peculiar Subject of our Enquiry in this Treatiſe, which ſeems to aim at what is extraordinary and uncommon; but this having not the leaſt Relation to the Oſteogeny of a *Fœtus*, I judge we ought not to tranſgreſs its Bounds.

CHAP. XII.
Of the SPINA DORSI.

SInce we are going to take a View of the *Spina Dorſi*, (in which we comprehend alſo the *Os Sacrum*) which in a *Fœtus* conſiſts of ſeparate and diſtinct Bones, we will firſt of all examine what it is that this Compoſition of the *Vertebra* differs in from adult Perſons; ſecondly, what peculiar Things belong to each Bone; and laſtly, how this Part of the Fabrick of the humane Body has its Beginning, its Increments, and its Accompliſhment at the Time of the Birth.

The whole Spine is incurvated in the *Fœtus* in the Nature of a Bow when it is a little bent, the convex Part whereof is on the Outſide: And this Figure was abſolutely neceſſary to the *Fœtus*, if we conſider its Poſition in the Womb of the Mother; which Figure is alter'd afterwards, when a Man begins to walk in an erect Poſture.

The Second Difference in the Spine of a *Fœtus* and that of adult Perſons is, that it has no Spinous Proceſſes; wherein we may moſt manifeſtly diſcover the Footſteps of the Providence of Nature, which would not frame any thing before its due Time that might prove incommodious to it ſelf: For in caſe the Spine had been provided with theſe acuminate Protuberancies, the Womb, with its Involucres during the Time of the Geſtation of the *Fœtus*, and its conglobated Situation there, muſt have been expoſed to no ſmall Danger from any external Violence. But provident Nature thought fit to provide againſt it, and to content it ſelf with ſhewing to us, in the Third Month after Conception, the Place of theſe Proceſſes, by ſome red Lines or Tracts in the Middle of the Cartilages, which encreaſe by degrees, but

but do not come to any Protuberancy before the Child is born.

Neither are the lateral bony Protuberances of the tranſverſe Proceſſes extant in a *Fœtus*, but only the Cartilage out of which they are to be formed, which has its Perforations for the Paſſage of the Veſſels: For in a *Fœtus* you may obſerve the Rudiments of all thoſe Things that afterwards become to be more conſpicuous in the Bone. I cannot therefore imagine what could move *Eyſſon* to attribute a *Foramen* only to the Firſt *Vertebra* of the Neck; it being certain, that the Firſt *Vertebra* has not the leaſt Prerogative, in reſpect to the *Foramina* of the Proceſſes, before the reſt; for they have every one of them a perforated Cartilage; and becauſe this Cartilage, ſo ſoon as it is ſeparated from its Body, becomes dry, and theſe minute Holes are cloſed up, they happen'd to eſcape his Sight, and conſequently he believed they had no ſuch Thing belonging to them.

The Fourth Thing in which the Spine of a *Fœtus* differs from that of adult Perſons, is the Threefold Diſtinction of the Bones, which is to be obſerved in every *Vertebra*: For Nature, when ſhe intended to frame that Cavity, which was to give a Paſſage to the Spinal Marrow, began the Oſſification in Three ſeveral Parts, which by a Coalition make up but One *Vertebra*, yet ſo as that the *Vertebra* is diſtinguiſh'd by the ſame Three Names it had obtained before this Coalition.

The Firſt interior Part, which is thick, and compreſs'd into a Kind of Rotundity, is call'd the *Body* of the *Vertebra*, and the other Two, tending toward the exterior Part of the Back, may be call'd the *Alæ*, or Wings, or the lateral Bones, and theſe are ſeparated one from the other in the Middle of the Back by a broadiſh intermediate Cartilage, and ſo they are from the Body by an intermedious Cartilage, which is not ſo broad as the other. Theſe are the Three ſmall Bones that form the *Vertebra*: And here I am obliged to give you a Caution not to look for any more, as *Fallopius* has done: For in his Anatomical Obſervations he ſays, it ſeem'd to him, that the Firſt *Vertebra* of the Neck in Children did conſiſt of Five Bones; but ſince it only ſeem'd ſo, and he does not poſitively ſay he ſaw it, I can eaſily ſolve this Doubt to my Reader, by aſſuring him, That in all the Scrutinies and Obſervations I have made of this, as well as of all the other *Vertebræ*, I could never find any more than theſe Three before-mention'd Bones, excepting nevertheleſs the *Os Sacrum*, in which Nature ſeems to keep to a peculiar Method before all the reſt: For in the Sixth Month after Conception ſhe produces Two ſmall Bones in the Two ſuperior *Vertebræ*, in that Part where it is join'd to the *Os Innominatum* by Means of a Cartilage; and by the Ninth Month the other Three are alſo provided for in the ſame Manner; ſo that by that Time each of them is compoſed of Five Bones, which ſeems to have been unknown both to *Eyſſonius* and *Coiterus*; for the laſt ſays, That theſe *Vertebræ* (ſpeaking of the *Os Sacrum*) conſiſt, like all the reſt, of Three Parts. And the Firſt ſays expreſly, That all the *Vertebræ* ſeated betwixt the Neck and the *Os Coccygis*, are diſtinguiſh'd into Three Parts. And concerning the *Epiſtropheus*, which is not comprehended within this Number of Three, we ſhall treat hereafter.

After what has been ſaid concerning the Structure of the *Vertebræ*, let us now ſee by what Steps kind Nature proceeds in this Fabrick, which, as far as I know, has not been treated of by any one with the ſame Exactneſs before.

And here you may obſerve how Nature has already in the Third Month formed a remarkable *Punctum* of Oſſification on the Inſide of the Sixth *Vertebra* of the Back, and from thence aſcending toward the Head, it diminiſhes by degrees to the Fifth *Vertebra* of the Neck, where it finiſhes its Task for this Month; the Four uppermoſt not ſhewing as yet the leaſt Sign of any thing that is oſſeous in their Body. Now let us alſo look downwards from the beforeſaid Sixth *Vertebra*, and we ſhall find the ſame oſſeous Points to decreaſe gradually, and in the ſame Proportion, to the Third *Vertebra* of the *Os Sacrum*. And here again Nature puts a Stop to the Third Month's Work in the Body of the *Vertebræ*. Now let us caſt our Eyes alſo upon the Two external and lateral Parts of the *Vertebræ*, where you will find Nature again taking a quite different Courſe;

for here ſhe begins at the uppermoſt *Vertebra* of the Neck, to ſhew us the largeſt Tract or Place of Oſſification, and ſo going downwards, it is diminiſhed gradually; ſo that before ſhe comes to the *Os Sacrum*, it appears to be no more than a *Punctum*, which is ſcarce diſcernable to the Eye, the *Os Sacrum* remaining as yet wholly cartilaginous on this Side.

But to make the Thing as perſpicuous and as plain as can be: In the Third Month the Four uppermoſt *Vertebræ* of the Neck conſiſt only of Two ſmall Bones, being deſtitute as yet of that Part which is call'd the Body of the *Vertebra*; and the Three ſuperior *Vertebræ* of the *Os Sacrum* conſiſt as yet of no more than One Bone, *viz.* the *Body*, becauſe the lateral Parts have nothing as yet appertaining to them that is like a bony Subſtance.

In the Fourth Month, the lateral Parts of the *Os Sacrum*, as far as to the *Coccyx*, begin to appear like an oſſeous Subſtance; and on the Inſide the oſſeous Points are encreaſed in Bulk, but not in Number. In the ſuperior Part of the Spine, the Third and Fourth *Vertebræ* of the *Neck* have obtained their *Bodies*; but the *Atlas* and the *Epiſtropheus* are as yet without their Bodies.

In the Fifth and Sixth Months, the *Os Sacrum* is provided with all its *Puncta* of Oſſification, as the *Epiſtrophæus* is with its oſſeous *Body*; though its dentiform Proceſs continues to be ſtill cartilaginous: But the *Atlas* is ſtill deſtitute of its *Body* in its anterior Part.

'Tis not till the Seventh Month that the *Tooth* of the *Epiſtrophæus* becomes oſſeous, and the *Atlas* begins to ſhew the oſſeous *Punctum* of its *Body*; ſo that this laſt now conſiſts of Three Bones, and the former may be ſaid to be compoſed of Four Bones.

In the Eighth and Ninth Months, all theſe Parts grow and encreaſe; but the *Os Coccygis* is, and continues ſtill to be cartilaginous; excepting that during the Ninth Month there begin to appear ſometimes One, ſometimes Two oſſeous *Puncta*, but ſcarce ſo big as a very large Pin's Head, on that Part of it which is call'd the *Body*.

CHAP. XIII.

The OS INNOMINATUM.

THE Diſtinction of the *Os Innominatum* into Three Parts, each whereof is diſtinguiſh'd by its peculiar Name, is not a bare Notion only, founded upon Fancy, as ſome will have it, who have confined their Anatomical Diſſections and Enquiries only to adult Perſons: For they were actually divided into Three Bones in the *Fœtus*, being each diſtinguiſh'd from and join'd one to the other by their intermediate Cartilages. The Firſt of theſe Three, which in adult Perſons makes the ſuperior and poſterior Part of the *Os Innominatum*, and is ſtill call'd the *Ilium*, retaining the ſame Name it had before whilſt it was as yet ſeparated, is united to the *Vertebra* of the *Os Sacrum* by certain intermediate Cartilages, and ſtretching upwards, is incloſed by a cartilaginous Brim of a ſemicircular Figure, and ſtretching forward, forms a conſiderable Part of the *Acetabulum*, and afterwards deſcending, is annexed to the Edge of the *Foramen Magnum*. The Second, which is call'd the *Os Pubis*, reaches from the fore Part of the *Os Ilium*, and the ſuperior Cartilage of the *Acetabulum*, to the cartilaginous Juncture, having a ſmall and ſlender Body. But the Third, call'd *Os Coxendicis*, or *Iſchii*, forming a conſiderable Part of the *Acetabulum*, deſcends obliquely with a thicker and ſomewhat broader Body, and in Conjunction with the *Os Pubis* juſt now mention'd, and with the anterior Cartilage, incloſes the *Foramen* of the oſſeous *Pelvis*. Now let us ſee how theſe Three Bones have their Generation and Augmentation in a *Fœtus*.

In the Second Month, that which afterwards is to make but One Bone, is no more than One diſtinct Cartilage; but in the *Ileon*, properly ſo call'd, near the *Acetabulum*, there appears a *Punctum* already oſſified, but ſuch as ſcarce exceeds the Bigneſs of the Head of a common middling Pin.

In the Third Month, that osseous *Punctum* is turn'd into Bone, and has acquir'd the same Figure to some Degree of Perfection we gave it before, *viz.* a semicircular One, surrounded by its Cartilage; but its Two Fellow-Bones remain as yet concealed under their Cartilages, without having any Thing as yet that is osseous.

In the Fourth Month, the *Os Coxendicis* begins to shew its white Head about the *Acetabulum*, but no bigger than an ordinary Pin's Head.

In the Fifth Month there begins to appear something that resembles to the *Os Pubis* near the *Acetabulum* also, the *Os Coxendicis* being considerably encreased by this time, and the *Os Ilii* being now arrived to its perfect Figure, and to a notable Magnitude. Thus these Three Bones conspire in the Composition of the *Acetabulum*, and encrease gradually till the Ninth Month; yet so, that even in the Ninth Month they remain still but loosely united by their intermediate Cartilages: For these cartilaginous Ligaments (as I may call them) contribute not a little not only to the Ease of the *Fœtus* in its globular Position in the Womb, but also to the Protrusion of the Child in the Birth, by contracting the Protuberancies of the *Os Ilium*.

CHAP. XIV.
Of the RIBS.

IN the History of the Ribs, there is scarce any remarkable Difference to be observed betwixt those of a *Fœtus* and of adult Persons, excepting in their Magnitude; wherefore our only Business at this Time is to see how the Ribs of the *Fœtus* differ from each other during the several Months of a Woman's being with Child.

In the Second Month, the uppermost and lowermost of the Ribs are still nothing else but tender Cartilages; whereas all the rest are already arrived to the Nature of Bones, and acquired their Colour and Solidity to such a Degree of Perfection, that the *Alveolus*, through which the Nerve and intercostal Vein and Artery passes, is already very discernable to the Eye. This Solidity, join'd to that of the Clavicle, (of which, more anon) was design'd for the Service and Security of the Heart and Lungs, to protect them against all manner of Compression, that so they might the better perform those Actions in their proper Cavity, as far as they are about that Time absolutely necessary for the Support of Life. But there is not the least Appearance as yet of any Articulation in the Extremities of the Ribs, being annex'd only to that rude undigested cartilaginous Body which is afterwards to form the whole Frame of the *Spina*.

In the Third Month, the uppermost Rib, which, as we told you, was nothing else but a tender Cartilage in the Second Month, now on a sudden acquires its osseous Substance, and that to such a Degree, as not to be inferior either in Breadth or its Solidity to any of those which were already Bones a whole Month before. By this Time also the lowermost Rib begins to shew some Signs of its Ossification; though sometimes (but very seldom) it remains cartilaginous to the Fifth Month.

From the Fourth to the Ninth Month, they undergo not any considerable Alteration, excepting what relates to their Magnitude and Solidity; for they grow bigger and stronger; But their small Heads wherewith they are to be articulated with the *Vertebræ*, remain as yet concealed, nay, even to the very Time of the Birth, under their cartilaginous Substance, without the least Signs of any Ossification. 'Tis the common Opinion of the Anatomists, That the Number of the Ribs seldom exceeds Twelve, and still much seldomer amounts to less. Among a great many *Fœtus's*, which I have had the Opportunity of examining into, I never met with more than One which had only Eleven Ribs on each Side; the Skeleton of which I keep by me for that Reason, as a particular Piece of Curiosity.

The Figure of the Ribs resembles an inflected Bow, the better to adapt it for the framing of the pectoral Arch. But there is besides

beſides this another Incurvation in the Ribs, to wit, the Extremities of the Six ſuperior turn upwards, but in their middle Part they turn downwards; whereas in the other Six, their middle and convex Part turns upwards, but their Extremities bend downwards. I cannot well imagine how this Manner of Incurvation has eſcaped the Obſervations and Knowledge of the Anatomiſts, which I am ſure I can aſſert upon my own diligent Scrutiny and Experience in the *Fœtus's*; for in theſe, this Variety in their Incurvation is much more remarkable than in adult Perſons; which in Effect is ſo far diminiſhed with Time and Age, that in ſome Bodies they do in a manner quite diſappear. If it is objected, That theſe Incurvations have not been diſcovered in ſeveral Skeletons; I would have them remember, that they have altered the true Figure of the Ribs, either in boiling, or elſe in ſeparating them from the Spine: For if you take Care not to ſpoil their natural Frame, you will not fail to be convinced by your own Eyes of the Truth of our Aſſertion.

CHAP. XV.

The STERNUM.

NAture appears under ſuch different Forms in the Fabrick of the *Sternum*, that it is no Wonder if the Authors do frequently contradict one another in this Point. For ſince it is obvious from their Writings, that each of them has confined his Scrutiny to One or Two *Fœtus's*, and conſequently each of them has met with a different Structure and Compoſition in his Obſervations of this Part, from what was obſerved by the other: Hence it is, that every one of them has taken it for granted, that what he had found in his Obſervations, muſt of Neceſſity be ſo in all the reſt. To remedy this Inconveniency, I will firſt give you an Account of what I have always obſerved in the *Fœtus's* that have fallen under my Scrutiny, and then will add ſomething concerning that Variety of Nature which has miſled others into an erroneous Opinion concerning the *Sternum*.

I never met with any one *Fœtus* wherein I could diſcover in the Fourth Month any Thing like a Bone; which ſeems to be agreeable to what *Euſtachius* ſays, to wit, That the *Sternum* in Infants is in its Firſt Generation altogether cartilaginous, of One entire Piece, and not diſtinguiſh'd by any Line.

From this Time to the Birth it is commonly believed to conſiſt of Seven ſmall Bones: *Fallopius* and *Bartholin* ſay of Eight. I can aſſure you, that in Five Infants of Nine Months old, the *Skeletons* of which I keep by me, I never could meet with more than Four, or Six at the moſt; never, I ſay, with more, but often with fewer: For ſometimes I have obſerved no more than Two in the Fifth Month. In the Sixth, ſometimes Four, ſometimes Five; nay, ſometimes but One, ſometimes none at all. *Bartholin* has perhaps met with ſomething like this; for (ſays he, ſpeaking of the *Sternum* in Infants) it is wholly cartilaginous, excepting its Firſt Bone. In the Eighth Month, you may ſtill obſerve a greater Variety; for their Number varies in divers *Fœtus's* from Three to Six: So that Nature ſeeming in this Point not to have confined her ſelf to any ſet Rule, nothing can be determin'd of it with any Certainty. The ſame Thing may be obſerved alſo concerning its Magnitude, Poſition, and Order; for Nature has not thought fit to begin its Oſſification always at the upper Part, but oftentimes the Firſt Bone appears in its middle Part. Neither are the ſuperior Bones at all times the biggeſt, for I have ſeen the inferior to exceed them in Bigneſs. Neither is their Poſition ſuch as to be always confined to a ſtreight Line, perpendicular to the Horizont, but oftentimes ſome of them ſtand out at the Sides, ſo as to make betwixt themſelves a Line parallel to the Horizont.

CHAP. XVI.
The CLAVICULÆ.

AS in the whole Fabrick of our Body, ſo we may in a more particular Manner acknowledge the provident Care of Nature in the Two Clavicles: they being the Firſt that are framed in the whole Body; for they are wholly oſſeous within Six Weeks from the Time of Conception. And it was of vaſt Conſequence to the *Fœtus* that it ſhould be ſo; for they being articulated with the *Sternum* by an *Arthrodia*, and with the *Acetabulum* of the *Humerus* by the ſame Articulation, and the *Scapulæ*, as well as the *Sternum*, being cartilaginous at firſt, there was an abſolute Neceſſity for ſome ſolid and firm Support, leſt the Heart ſhould ſuffer a Compreſſion from them: For which Reaſon it is alſo, that theſe Two Bones exceed all the other Bones in Thickneſs till the Third Month; ſo that even the Bones of the Limbs do not out-grow them before the Fourth Month. From their Firſt Beginning they alſo obtain the ſame Shape and Figure in their full Perfection, as in adult Perſons.

CHAP. XVII.
The SCAPULÆ.

THE Parts of which the *Scapula* conſiſts are, the *Baſis*, the Spine, the Neck, the *Proceſſus Coracoides*, or the *Anchoriformis*, and the *Proceſſus* call'd the *Summus Humerus*. We muſt treat of every one of them in relation to the *Fœtus*, and will begin with the whole Maſs of the *Scapula*, which in the ſecond Month is nothing elſe but a rude, indigeſted, and round Cartilage, mark'd in its Middle with a white *Punctum*, which diſcovers to us the Firſt Beginning of its Oſſification. This Cartilage terminates in a narrow Extremity, without any apparent Signs of Diſtinction; yet has in the Middle of its narrow Part a longiſh white Line, out of which afterwards is formed the *Os Humeri*, diſtinct from the *Scapula*.

In the Third Month, it begins to aſſume its natural Form. Its Spine is already become oſſeous, ſo far as to be encloſed only in the upper Part by a ſmall Cartilage, unto which adheres the *Summus Humerus*, which is as yet wholly cartilaginous, as well as the *Proceſſus Coracoides*, and the Neck; nay, even the *Baſis* is as yet for the greateſt Part cartilaginous. I judged I ought to be the more exact in this Account, to enable the Reader to determine the Point in queſtion between *Eyſſon* and *Riolan*, and *Coiterus*: The Firſt of which charges the other Two with a Miſtake, in ſaying, that the Neck was cartilaginous. This Doubt is eaſily ſolved, by ſaying, That *Eyſſonius*'s *Fœtus* (for I think he diſſected no more than One) was above Three Months old.

It is ſurprizing, and almoſt paſt Belief, with what Celerity Nature goes on, eſpecially after the Third Month, in the Encreaſe and Accompliſhment of the Bones in a *Fœtus*: For in the Fourth Month, the Neck, which was in the Third Month altogether, and the *Baſis*, which was above half, cartilaginous, the Firſt is now half oſſeous, and the Second has acquired ſuch a Degree of Oſſification, as to be incloſed only by a very narrow cartilaginous Edge: So that *Riolan* and *Coiterus* were in the Right, when they aſſerted, That the *Cervix* was wholly cartilaginous, to wit, before the Fourth Month. Neither was *Eyſſonius* in the Wrong, when he ſaid, That he had found it to be of an oſſeous Subſtance in Part; but at the ſame time he ought not to have charged them with a Miſtake, ſince they ſpoke of a *Fœtus* that was not yet come to the Fourth Month.

But to return to the *Baſis*, that ſame narrow Edge which incloſes it in the Fourth Month;

Month, diminiſhes gradually in the Fifth, and the ſucceeding Months; but at the lower Extremity, where it is pointed, it does not acquire the Solidity of a Bone ſo ſoon, becauſe that Part is more remote from the Center of the Circle, which Nature preſcribes in the Work of Oſſification.

As to the Two Proceſſes, they remain in Part cartilaginous till the Ninth Month, as well as the *Acetabulum*, and the ſmall Head of the *Os Humeri*, which is inſerted into it, all which do not attain to the Solidity of a perfect Bone, not even at the Birth of the Infant: Whence it is, that in a new-born Babe, the Arm is not to be lifted up without ſome Difficulty. Concerning the *Fiſſure*, or Interſtice betwixt the *Coracoides* and the *Baſis*, I can ſay nothing elſe than that before the Fifth Month there appears not the leaſt Sign or Footſtep of it. Afterward it becomes hollow more and more by Degrees, till at laſt in the Ninth Month it acquires a ſemilunar Figure, and afterward is form'd juſt as we obſerve it in adult Perſons.

CHAP. XVIII.

The SUPERIOR LIMBS.

WHat has been obſerved in the Account we have given juſt now of the *Scapula*, to wit, that there appear'd not the leaſt Signs of its Articulation with the *Os Humeri* in the Second Month, may be again applied to the Bones of the ſuperior Limbs; for here neither the *Cubitus* is as yet diſtinguiſh'd from the *Humerus*, neither the *Radius* from the *Cubitus*, either by any Articulation, or any Separation in the *Middle*: But they make altogether but One Cartilage; in the ſuperior Part of which there does appear a longiſh white Line, where the *Humerus*, and in the inferior Part Two others, plac'd one by another, where the *Cubitus* and *Radius*, are to begin their Oſſifications. And in this Place I cannot but obſerve one Thing, which indeed many of the Bones have common with each other, but is more conſpicuous in theſe, to wit, that whilſt they are growing, and begin to acquire ſome Solidity, they have in that middle Part where we obſerve the Firſt Signs or white Points of their Oſſification, a Cavity within, and ſuch a Cavity as is fill'd with Marrow, and ſurrounded with very firm Walls, *i. e.* with an oſſeous Subſtance, which is more firm and ſolid in this Part than in the others; and that the Extremities where theſe Walls are not ſo firm, are fill'd up with a certain ſpongeous Subſtance, which may rather be ſaid to imitate an oſſeous Subſtance, than to have acquir'd either the Nature of the Bones, or their Conſiſtency.

The *Carpus*, *Metacarpus*, and the *Phalanxes* of the Fingers, are no more than One Cartilage as yet; nevertheleſs the Cartilage is diſtinguiſh'd into Five Parts, in the Extremity of which, by the Help of an Optick Glaſs, you may obſerve certain whitiſh *Puncta*, in which the oſſeous Subſtance is to lay the Foundation of its future Solidity.

In the Third Month, the ſingle Cartilage (as I told you before) of the ſuperior Limbs begins to ſhew ſome ſuperficial Impreſſions of an Articulation. The *Cubitus* and *Radius* are ſo far ſeparated one from the other, as not to form any longer One Cartilage, but are each diſtinguiſh'd by its own Superficies. In the *Carpus* there appear certain darken'd *Puncta*, each of which points at the Center of its Oſſification. The *Metacarpus* and the Ranks of the Fingers do by this Time ſhew us their diſtinct ſmall oblong Bones.

In the Three following Months, there is no Variation in theſe Parts, except what depends on their gradual Encreaſe.

In the Seventh and Eighth Months, there begin to appear but obſcurely, but in the Ninth Month there appear plainly, and become conſpicuous, all the *Sinus's*, Protuberancies, the *Trochlear Appendixes* of both the *Epiphyſes* of the *Humerus*, the *Cubitus*, and of the *Radius*, the Eight Cartilages of the *Carpus*, and of the Articulations of the *Metacarpus*, and the Fingers, as diſtinct as the Cartilages of the *Fœtus's*, as they do afterward

terward in the Bones of adult Perſons. And in this Reſpect we muſt not give entire Credit to *Coiterus*, neither to *Riolan*, when they tell us, That the Bones of the *Carpus* in a *Fœtus*, whilſt it is growing, conſiſt only of One Cartilage, which afterwards are diſtinguiſh'd, and become oſſeous. For if thereby he means One rude Cartilage, without any Conformation, he is in the Wrong, as well as *Eyſſonius*, when he ſays, That the inferior Cartilage of the *Cubitus* does not ſhew the leaſt Sign of the *Proceſſus Styloides*, or of any other Thing. For I can aſſure you, upon my own reiterated Experience, That in the Fourth Month there are to be ſeen already ſome Signs of theſe diſtinct Parts, which he would make us believe are not to be met with in the Ninth. And therefore, to wipe off all theſe Objections at once, or with one Sponge, as the Saying is, it is beyond all Diſpute, that all, even the moſt minute Parts, which are afterward to be obſerved in the Bones, begin to diſcover themſelves in the Seventh Month; and in the Ninth are plainly conſpicuous in the Cartilages. We muſt not forget to obſerve alſo, That the *Os Humeri* in the *Fœtus's* and newborn Children is ſtreight and round, but in adult Perſons it becomes ſomewhat bent and contorted.

CHAP. XIX.

The INFERIOR LIMBS.

THE *Os Femoris* is join'd to the *Os Tibiæ* by an intermediate Cartilage, without the leaſt Appearance of any Articulation in the Two Firſt Months. Concerning the *Os Tibiæ*, I was almoſt aſtoniſhed to find not the leaſt Footſteps or Tracts of the *Focile Minus* in Two *Fœtus's* of that Age, which I had the Opportunity of examining with all the Application that poſſibly could be: So that I am at a Stand what to determine in this Point; for to ſay, that there is no ſuch Thing in a *Fœtus*, ſeems to contradict the provident Care of Nature, in not forming the leaſt Rudiment of ſo remarkable a Part of our Body as this is, in Two Months Time; and on the other Hand, as I have taken an unſhaken Reſolution not to aſſert any Thing for Truth, but what I have plainly and diſtinctly obſerved with my own Eyes, I am free to confeſs, that if any one hereafter proves more fortunate in this Reſpect, ſo as to find out by his own Scrutiny or Induſtry this *Focile Minus* at this Age, and to diſcover it to the World, we ſhall doubtleſs think our ſelves highly indebted to his Induſtry for the Solution of this ticklish Queſtion.

Conſidering that Nature keeps the ſame Rule in the Formation of the *Tarſus* and *Metatarſus*, as well as of the Toes, as it does in the *Carpus*, the *Metacarpus*, and in the Fingers, it would be ſupervacaneous for us to enlarge upon them: It will be ſufficient to ſay only thus much, That they are wholly cartilaginous, and that there appear in them only here and there certain *Punctula*, which muſt be look'd upon as the firſt and rude Beginnings of the ſucceeding Oſſification.

In the Third Month, the *Focile Minus* (come it from whence it can) makes already its Appearance, and is as bony as the *Tibia* it ſelf, but ſomething ſlenderer and ſhorter. The *Metatarſus* begins to approach towards ſomething that is oſſeous, but ſo obſcurely, that thoſe that have an Opportunity of making a true Obſervation of it, will be obliged to confeſs, that it is ſomething, which as it has not as yet acquir'd an oſſeous, ſo it has not quite abandoned its cartilaginous Subſtance. It remains alſo very dubious, whether the *Patella* be at this Time oſſeous or not.

In the Fourth Month, and for a conſiderable Time after the Birth of the Child, it remains altogether cartilaginous. The Bones of the *Tarſus* and the *Metatarſus* are conſiderably encreaſed in their Magnitude; and the *Puncta* of the Firſt, which appear'd hitherto ſomewhat dubious, do now ſhew themſelves by their reddiſh Colour to be the genuine Centers (as ſome have call'd them before us) of their Oſſifications. In the Structure of the Toes, Nature ſeems to have

taken a peculiar Courſe far different from that which ſhe has thought fit to chooſe in the Fingers: For in this Fourth Month we are now ſpeaking of, at their lowermoſt as well as their uppermoſt Articulations, they are diſtinguiſh'd by certain *Puncta*; whereas their middle Parts do not as yet ſhew the leaſt Signs of any Oſſification.

In the Fifth and Sixth Months, the Firſt Toe next to the Great One is provided with the *Punctum* in the middle Articulation, and as if they were confin'd to certain Rules of Precedency. In the Seventh and Eighth Months the Second and Third: And laſtly, in the Ninth Month, the Little Toe alſo, ſhews us the Rudiment of its Oſſification in the middle Articulation.

The Nails being not properly Bones, but a peculiar Subſtance, which is reckon'd moſt commonly among the Excrements, cannot well challenge a Place among theſe Obſervations; though they begin to make their Appearance already in the Third Month.

To conclude this Head, during the Fifth, Sixth, Seventh, and Eighth Months, all the Bones of the Feet, as well as of the Legs, encreaſe in Magnitude by Degrees, after they have once made their Appearance in the Fourth Month: But the Seventh Month is peculiarly remarkable for the Appearance of the Firſt Beginnings of the *Calcaneum*; and the Eighth for the Oſſification of the *Aſtragalus* and the *Calcaneum*; as alſo for ſome Articulations that appear in the Cartilage: I ſay, for ſome; for all the Articulations are not perfectly diſcernable before the Ninth Month.

Directions *for the following* Tables *and* Figures, *relating to the* Oſteogenia, *or the Treatiſe of the Generation of the* BONES *in a* Fœtus.

THAT the Reader may reap all the Benefit that poſſibly may be by the Inſpection of the following Figures, and comparing them with the Deſcriptions of them, it is requiſite we ſhould give the following Directions: In this *Oſteogeny*, we treat in each Chapter of One particular Bone or Bones belonging to it, ſo as to make our Obſervations upon them, how they proceed gradually in every Month: But theſe Anatomical Tables repreſent all the Bones together, in ſuch a Manner as they are obſerved to be in One of theſe Months: So that if you have a Mind to conſult theſe Cuts, you need only to take Notice what Month it is the *Oſteogeny* ſpeaks of, and then have Recourſe to the Table which repreſents the *Fœtus* of the ſame Month, where you will meet exactly with the ſame Draught or Figure of the Bone as it is deſcribed in the *Oſteogeny*.

The next Thing we thought worth our taking Notice of is, that becauſe there is frequently an Opportunity of deſcribing ſome very minute Parts of ſome Bones, the Bulk of the Figure would not permit us to put the Letters which direct you to that minute Part, in the very ſame Place where it is extant in the Figure, becauſe it muſt of Neceſſity have obliterated that very Part which was to be pointed at by the Letters: To avoid this Inconveniency, we have drawn a ſmall Line, which beginning at that Part it is to indigitate, reaches beyond the Figure, at the Extremity of which we have plac'd the Letter.

An EXPLANATION of the following FIGURES, relating to the *OSTEOGENIA FOETUUM.*

TABLE III.

Figure I. *repreſents a* Fœtus *of Five Months.*

A. The *Fontanella.*

B. The Suture that divides the *Os Frontis.*

C, C. The Cartilaginoſity in the Center of the Parts of the *Os Frontis.*

D.

Tab. III.

Fig. X.

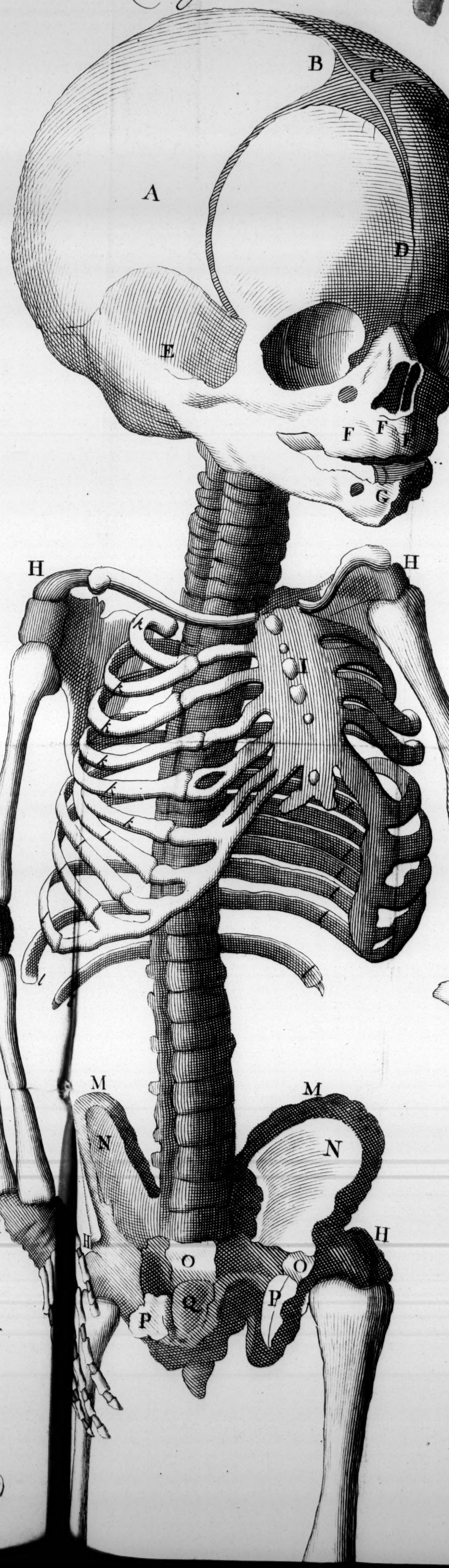

Fig. I.

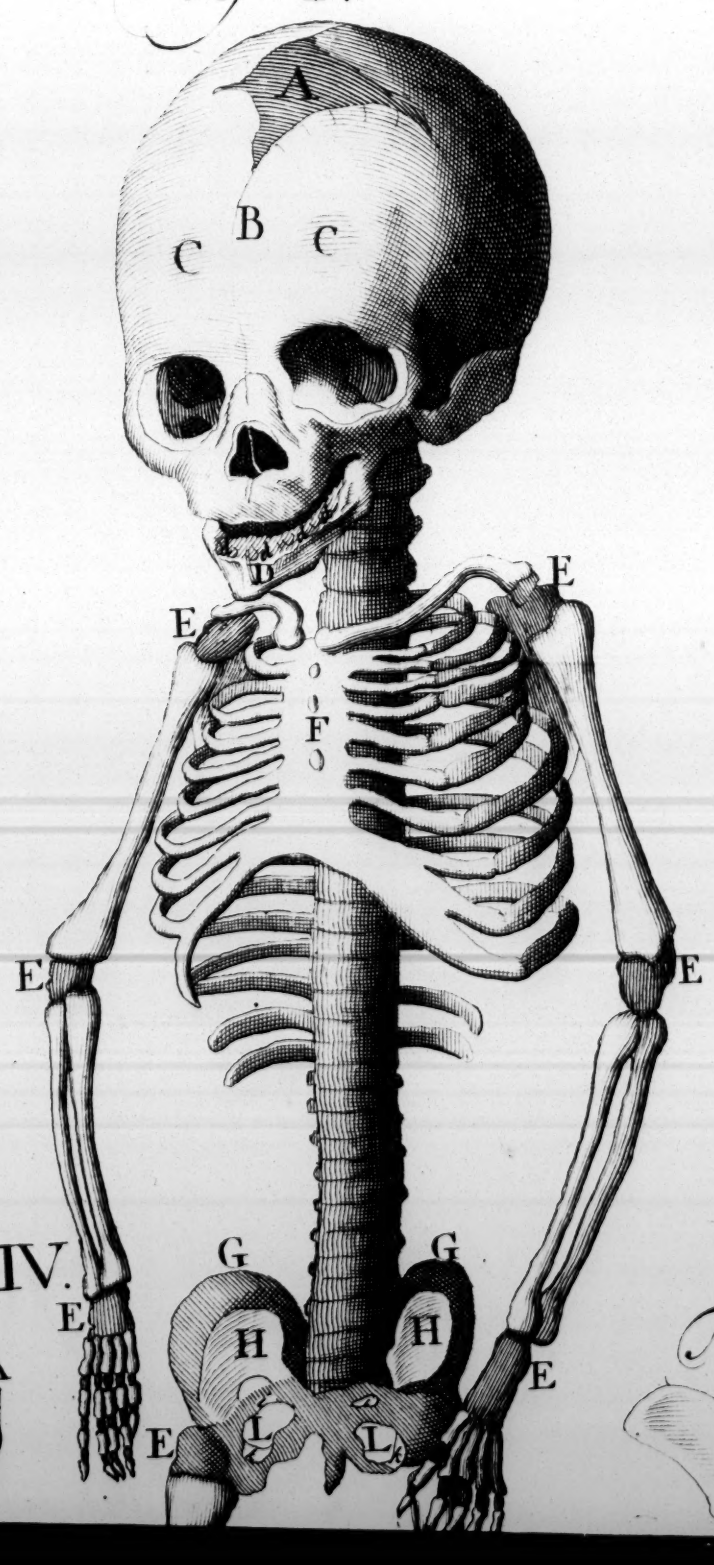

Fig. IV.

Fig. II.

Fig. XI.

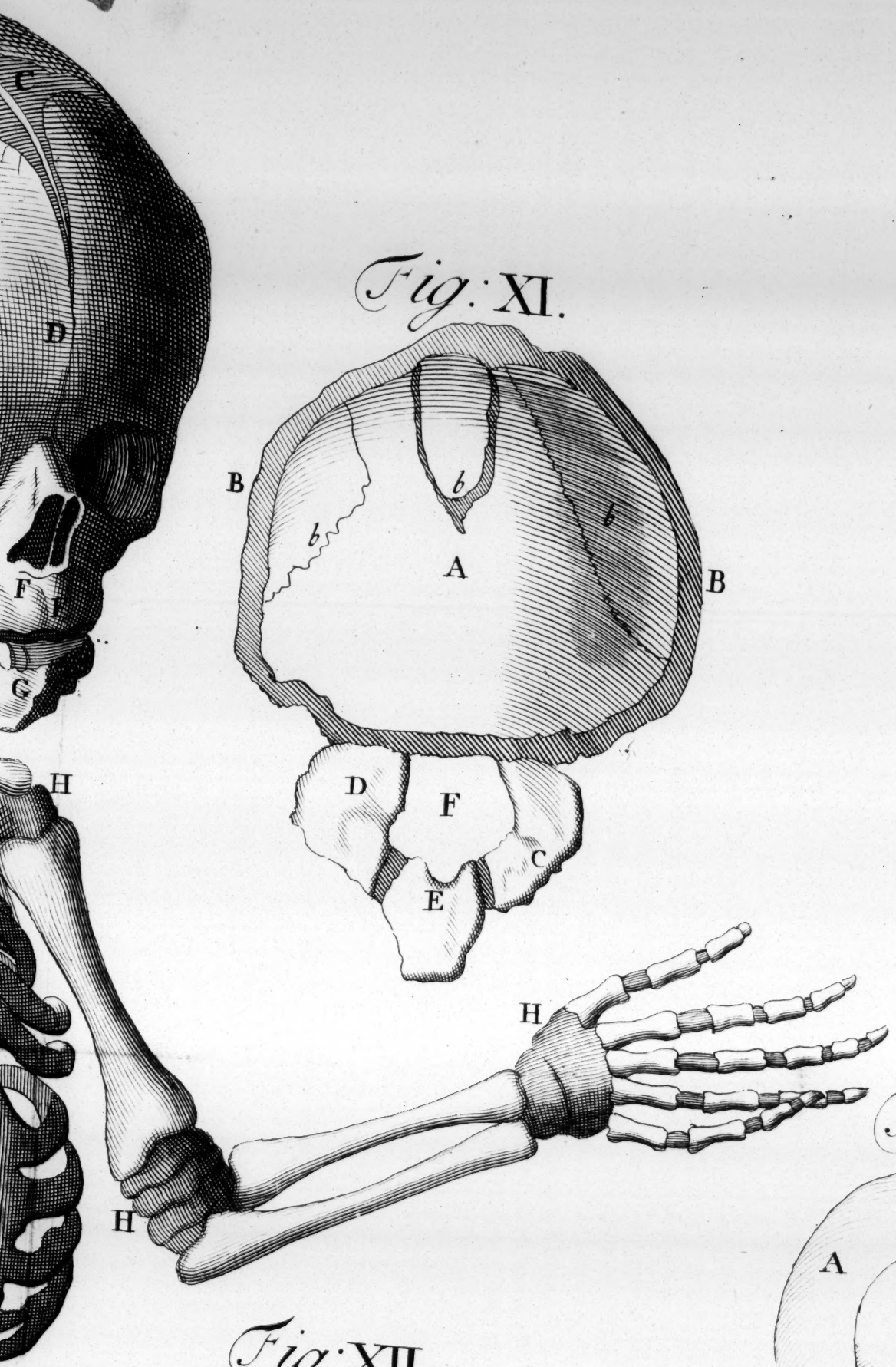

Fig. VII.

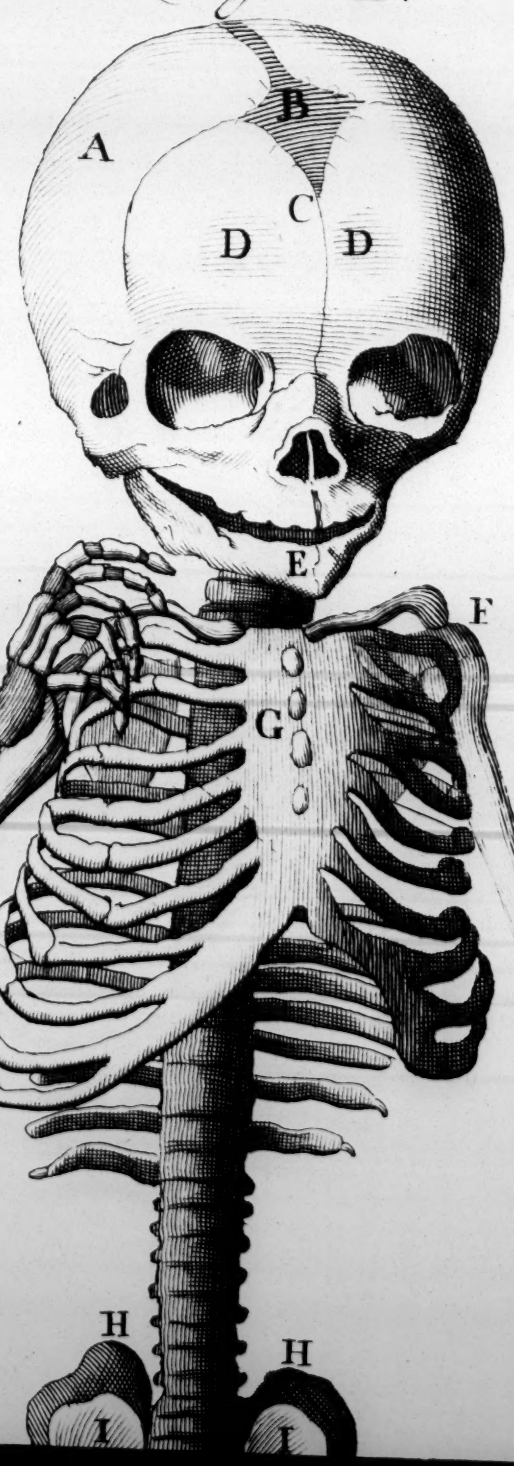

Fig. VIII.

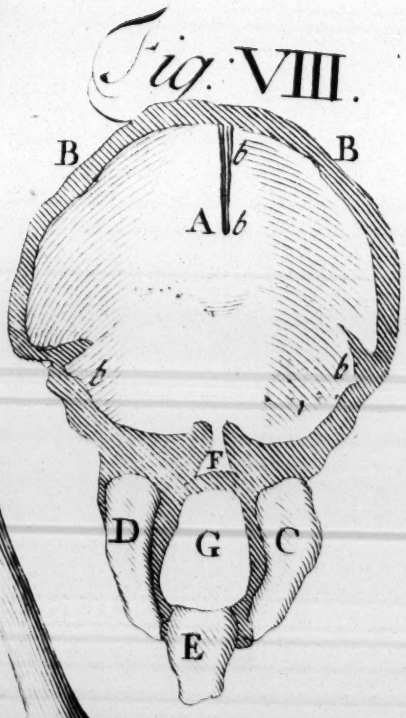

Fig. XII

Fig. XIII.

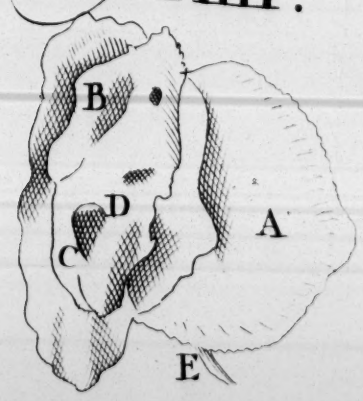

Fig. XIV.

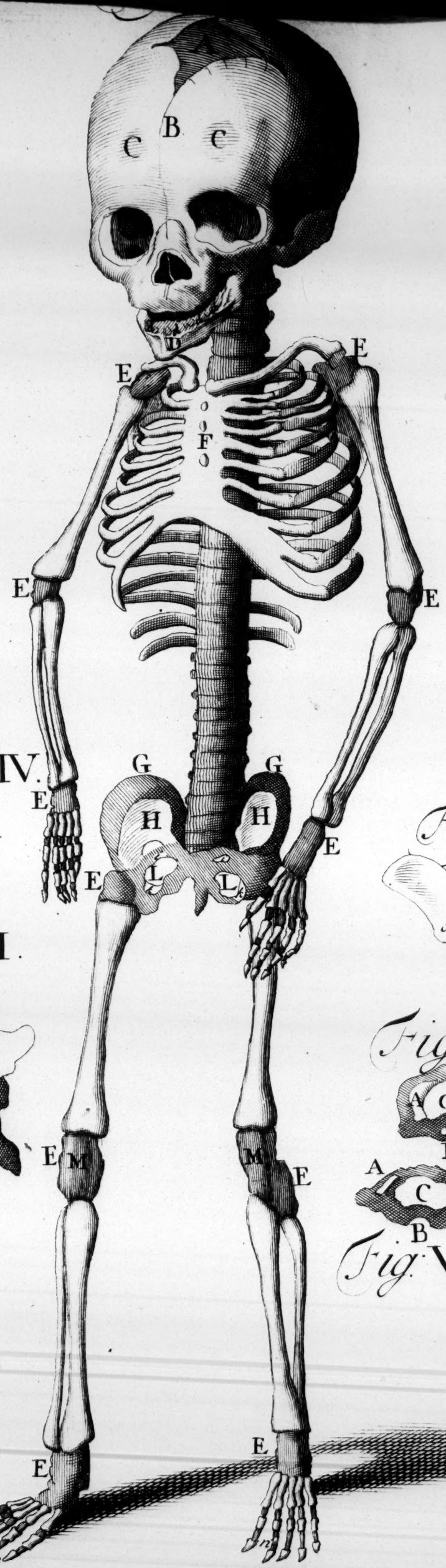

Fig. IV.

Fig. III.

Fig. II.

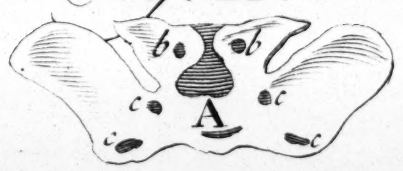

Fig. V.

Fig. VI

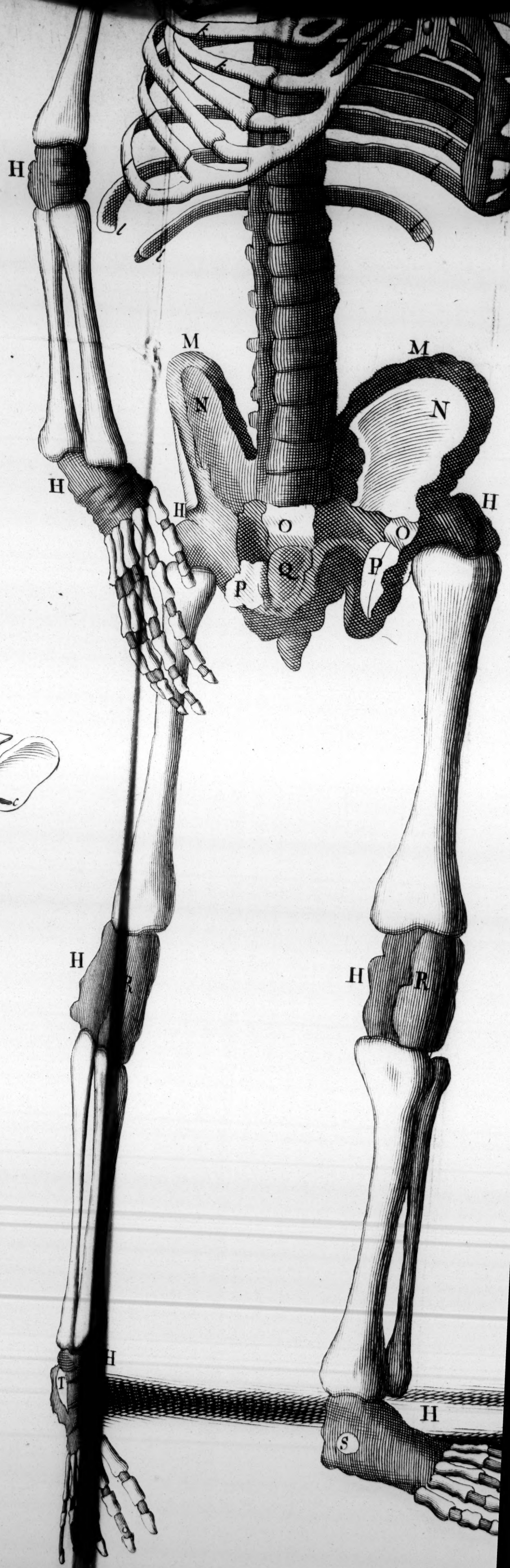

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Fig. VII.

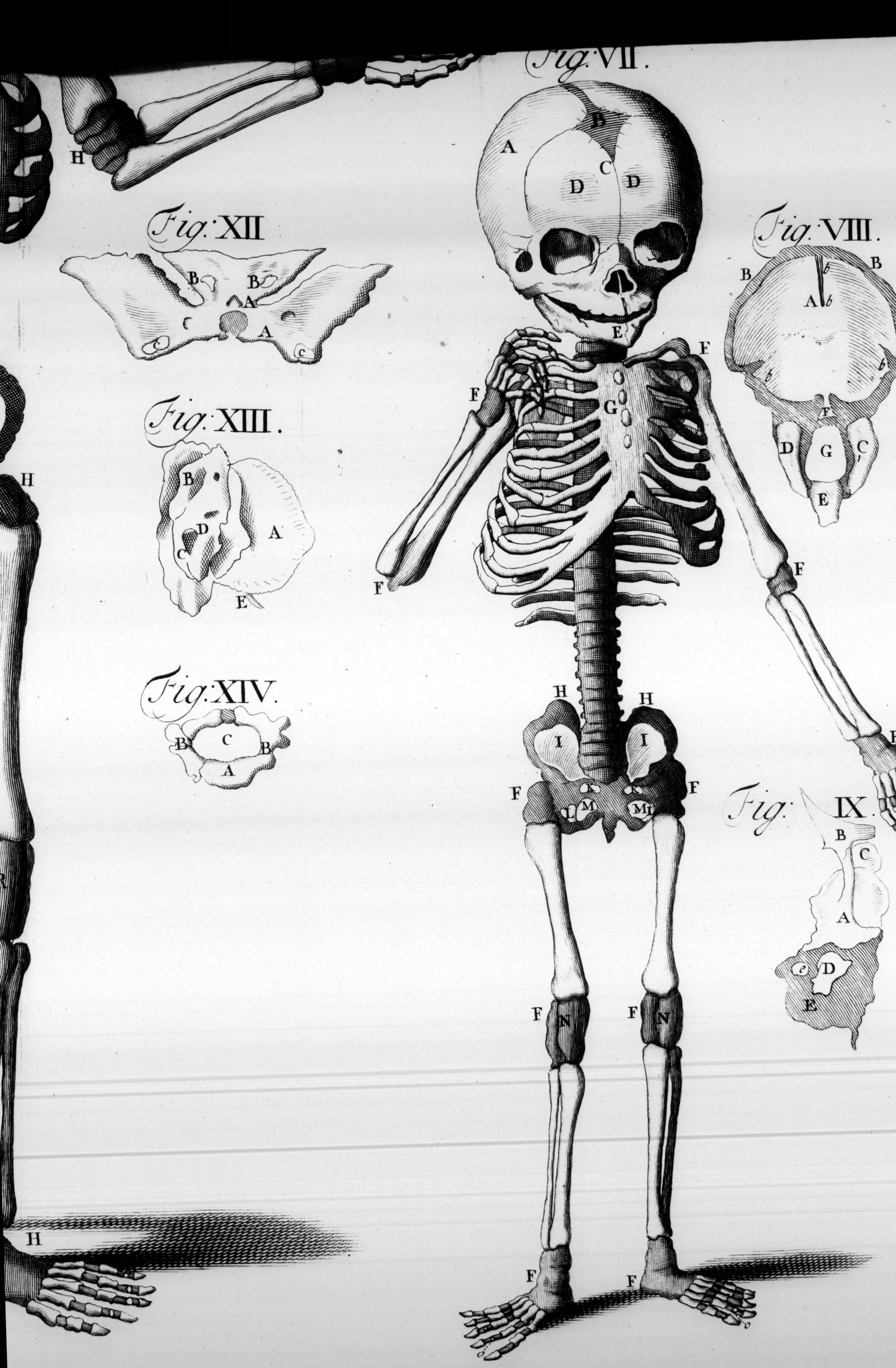


Fig. XII

Fig. XIII.

Fig. XIV.

Fig. VIII.

Fig. IX.

Theodore Kerkeringy's Osteogenia Fœtuum.

The Diviſion in the inferior *Maxilla*.
d, d, &c. The *Alveoli* or Sockets of the Teeth.
E, &c. The larger Articulations, being all cartilaginous; the leſſer in the Hands and Feet being diſcernable by their Blackneſs.
The ſmall Bones of the *Sternum*.
G. The Cartilage which ſurrounds the *Os Ilii*.
H. The *Os Ilium*, ſo call'd in a ſtrict Senſe, diſtinguiſh'd from the Two other Bones of the *Os Innominatum*.
i, i. The *Os Pubis*, diſtinguiſh'd from the other Two.
k, k. The *Os Coxendicis*, diſtinguiſh'd from the *Os Pubis* and the *Os Ilii*.
L, L. The large *Foramina* in the *Os Pubis* and the *Os Coxendicis*.
M, M. The *Patella*, cartilaginous.
n, n. The *Punctum* that now appears in the middle Articulation of the Firſt Toe next to the Great Toe.

igure II. *repreſents the* Os Sphænoides, *already united by a Coalition in a* Fœtus *of Five Months.*

The greater Cartilage near the *Sella Equina*.
b. The *Foramina* for the Paſſage of the Optick Nerves.
c, c, c, c. Other *Foramina* for the Paſſage of Nerves.

Figure III. *repreſents the Three ſmall Bones of the* Os Petroſum.

The *Os Squamoſum*.
The *Proceſſus Zygomaticus*.
The Membrane of the *Tympanum*.
The oſſeous Circle which ſurrounds the *Tympanum*.
e, e, e. The Three Bones of the *Os Petroſum* diſtinct.
E. The remaining Part of the *Os Petroſum*, being cartilaginous.

Figure IV. *repreſents the ſmall Bones which belong to the Hearing.*

The *Malleolus*, with its oblong Proceſs, *a.* unto which adheres the Membrane of the *Tympanum*, being as yet cartilaginous.
B. The *Incus*, with its Proceſs, *b.* being likewiſe as yet cartilaginous.
C. The *Stapes*, being not arrived as yet to its Figure of an *Iſoſceles*.

Figure V. *The* Epiſtropheus.

A. The Two lateral Proceſſes of the *Epiſtropheus*, being already oſſeous.
Its Body alſo begins to be oſſeous.
C. The *Foramen* for the Paſſage of the Spinal Marrow.

Figure VI. *repreſents the* Atlas.

A. The Two Proceſſes of the *Atlas*, being already oſſeous.
Where the Body is to be formed, there is nothing elſe but a Cartilage to be ſeen as yet.
C. The *Foramen* for the Paſſage of the Spinal Marrow.

TABLE III.

ure VII. *repreſents a* Fœtus *of Six Months. This does not exceed ſo much in its Bigneſs the preceding* Fœtus, *nor is ſo much inferior in its Bigneſs to*

the following, as the ſmaller Fœtus's *of the former Months differ one from the other in their Proportion.*

[N. B. *This* Figure *is Engraven a little leſs than it ought to have been.*]

A. The *Os Syncipitis.*
B. The *Fontanella.*
C. The Suture that divides the *Os Frontis.*
D, D. The Cartilaginoſity which appears as yet in the Center of the Parts of the *Os Frontis.*
E. The Diviſion in the inferior *Maxilla.*
F, F, F, &c. The larger Articulations, being all cartilaginous. The leſſer in the Hand are ſufficiently conſpicuous by their Blackneſs.
G. The ſmall Bones of the *Sternum.*
H, H. The Cartilage which ſurrounds the *Os Ilii.*
I, I. The *Os Ilii,* ſo call'd in a ſtrict Sense divided from the Two other Bones of the *Os Innominatum.*
K, K. The *Os Pubis,* diſtinguiſh'd from the Two others.
L, L. The *Os Coxendicis,* diſtinguiſh'd from the *Os Pubis* and the *Os Ilii.*
M, M. The large *Foramina* in the *Os Pubis* and in the *Os Coxendicis.*
N, N. The *Patella,* being cartilaginous.
o, o. The oſſeous *Punctum,* which is very apparent in the middle Articulation of the Firſt Toe next to the Great Toe.

Figure VIII. *ſhews the* Os Occipitis.

A. The Firſt Part of the *Os Occipitis,* to wit, the great triangular Bone, containing theſe Four irregular Sutures mark'd with *b, b, b, b.*
B, B. The Cartilage which ſurrounds the *Os Occipitis.*
C. The Second Part of the *Os Occipitis.*
D. The Third Part of the *Os Occipitis.*
E. The Fourth Part of the *Os Occipitis.*
F. The ſmall triangular Bone, which has begun to appear ever ſince the Fourth Month.
G. The *Foramen* through which paſſes the Spinal Marrow.

Figure IX. *repreſents the Two ſmall Bones in the* Os Petroſum.

A. The *Os Squamoſum.*
B. The Firſt Bone of the *Superior Maxilla.*
C. Part of the *Proceſſus Pterigoideus.*
D. Part of the *Os Petroſum,* which is united by this Time by the Coalition of Two others.
e. The Third ſmall Bone of the *Os Petroſum.*
E. The cartilaginous Circumference of the *Os Petroſum.*

TABLE II.

Figure I. *repreſents a* Fœtus *of Seven Months, being ſomewhat bigger than they uſually are at that Time, becauſe this was a Twin, brought alive into the World.*

[N. B. *This* Cut *is alſo ſomewhat leſs than it ſhould be.*]

A. The *Os Syncipitis.*
B. The *Fontanella.*
C. The Suture that divides the *Os Frontis.*
D. The *Os Temporum.*
E. The Diviſion in the inferior *Maxilla.*
F, F, &c. All the larger Articulations, being as yet cartilaginous. The leſſer in the Hands and Feet are eaſily diſcernable by their Blackneſs.
G. The ſmall Bones of the *Sternum.*
H, H. The Cartilage which ſurrounds the *Os Ilii.*
I, I. The *Os Ilii,* ſo call'd in a ſtrict Sense diſtinguiſh'd from the other Two Bones of the *Os Innominatum.*
K, K. The *Os Pubis,* diſtinguiſh'd from the Two others.
L, L. The

Tab. II.

Fig. I.

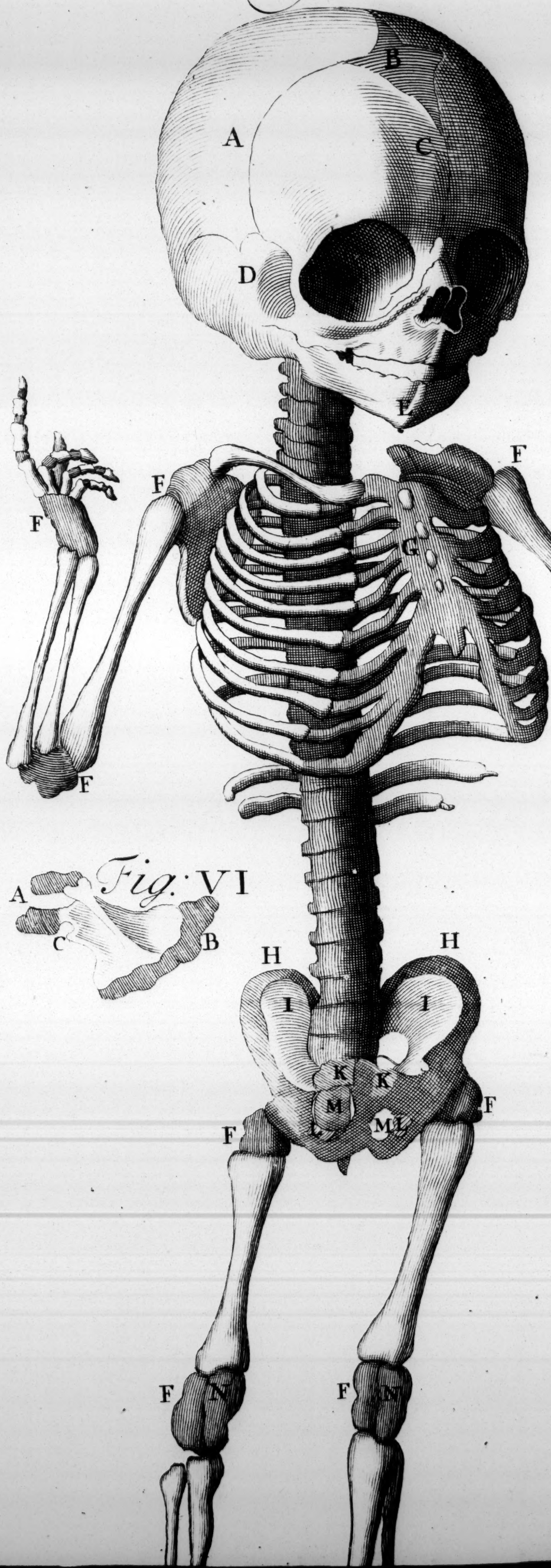


Fig. VI

Fig. II.

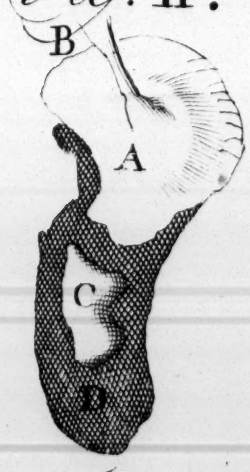


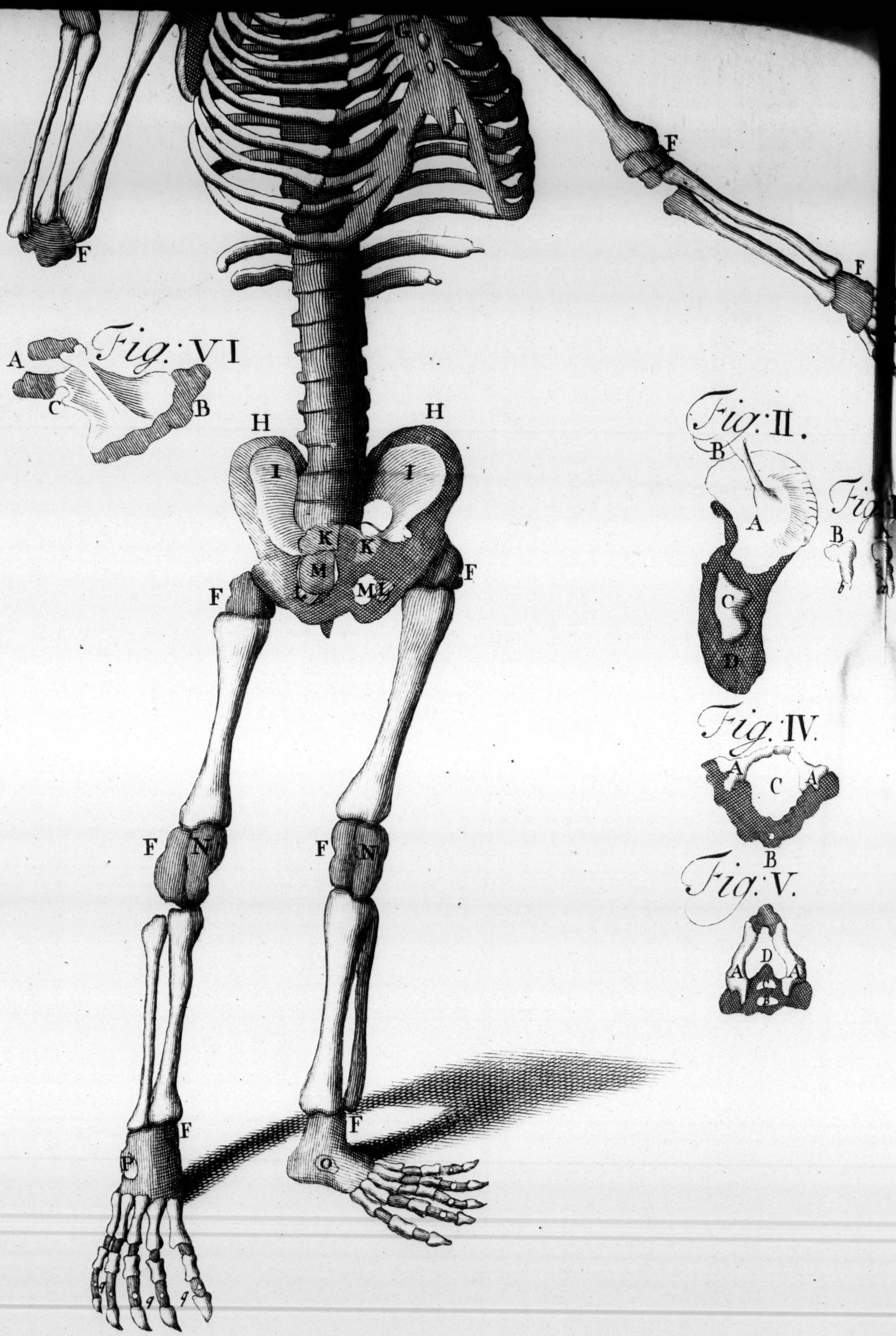
Fig. III.

Fig. IV.

Fig. V.

Fig. VII.

Fig. VIII.



This Cut is taken out of Theodore Kerkeringy's Osteog

F

H

K

L

K

L

M

M

H

H

G

O

N

N

H

H

Fig. III.

B

C

H

H

H

P

P

H

H

R

H

Q

Fig. VIII.

D

G

A

I

E

C

B

Osteogenia Fœtuum

L. The *Os Coxendicis*, diſtinguiſh'd from he *Os Pubis* and from the *Os Ilii.*
M. The large *Foramina* in the *Os Coxen-icis* and in the *Os Pubis.*
N. The *Patella*, being cartilaginous.
O. The *Os Aſtralagi.*
P. The *Os Calcanei*, which cannot be ſeen here on its right Side.
q, q, q. The *Puncta* that appear in the Middle Articulation of the Firſt, Second, and Third Toes from the Great Toe.

ure II. *repreſents the ſmall Bones in the* Os Petroſum; *which being at firſt Three in Number, and afterward Two, are now united in One by Coalition.*

The *Os Squamoſum.*
The *Proceſſus Zygomaticus.*
The Subſtance of the *Os Petroſum*, conſiſting of the ſo often before mention'd Three Bones united into One.
D. The Circumference of the *Os Petroſum*, being as yet cartilaginous.

Figure III. *ſhews us the ſmall Bones of Hearing.*

The *Malleolus.*
The *Proceſſus Major* of the *Malleolus*, having at its Extremity ſomething as yet that is cartilaginous.
B. The *Incus.*
b. The Proceſs of the *Incus*, being cartilaginous at its Extremity.
C. The *Stapes.*

Figure IV. *The* Atlas.

A. The Two oſſeous lateral Proceſſes of the *Atlas.*
The oſſeous *Punctum* which appears in this Month, and of which the Body is to be form'd.
C. The *Foramen* for the Paſſage of the Spinal Marrow.

Figure V. *The* Epiſtropheus.

A. The Two oſſeous lateral Proceſſes of the *Epiſtropheus.*
The Body.
C. The Beginning of Oſſification in the *Dens.*
D. The *Foramen* for the Paſſage of the Spinal Marrow.

Figure VI. *The* Scapula.

A. The Two Proceſſes, to wit, the *Summus Humerus* and the *Coracoides*, being as yet for the moſt Part cartilaginous, and continuing to be ſuch till the Ninth Month.
B. The narrow Edge or Brim which ſurrounds the *Baſis*, being cartilaginous.
C. The ſemilunar Fiſſure betwixt the *Coracoides* and the *Baſis*, which begins to ſhew it ſelf in the Fifth Month.

TABLE II.

Figure VII. *repreſents a* Fœtus *of Eight Months.*

The *Os Syncipitis.*
The *Fontanella.*
The *longitudinal Sinus*, being conſpicuous t this Time through the *Dura Mater.*
The Suture which diſtinguiſhes the *Os rontis* in Two Parts.
E. The *Os Temporum.*
F. The Diviſion in the inferior *Maxilla.*
H, H, H, &c. All the larger Articulations, being as yet cartilaginous. The leſſer in the Hands and Feet are eaſily diſcernable by their Blackneſs.

I. The

I. The ſmall Bones of the *Sternum.*
K, K. The Cartilage which ſurrounds the *Os Ilii.*
L, L. The *Os Ilium*, ſo call'd in a ſtrict Senſe, diſtinguiſh'd from the Two other Bones of the *Os Innominatum.*
M, M. The *Os Pubis*, diſtinguiſh'd from the other Two.
N, N. The *Os Coxendicis*, diſtinguiſh'd from the *Os Pubis* and the *Os Ilii.*
O, O. The large *Foramina* in the *Os Pubis* and in the *Os Coxendicis.*
P, P. The *Patellæ*, as yet wholly cartilaginous.
Q. The *Os Aſtragali*, ſurrounded on all Sides with a Cartilage.
R. The *Os Calcanei.*
ſ, ſ, ſ, The *Puncta* which appear in the middle Articulation of the Firſt, Second and Third Toes from the Great Toe.

Figure VIII. *ſhews the Membrane which is extended over the Membrane of the* Tympanum, *and the* Proceſſus Styloideus, *being as yet cartilaginous.*

A. The *Os Squamoſum*, diſtinct from the *Os Petroſum* in a *Fœtus.*
B. The *Os Petroſum.*
C. The Cartilage which divides theſe Two Bones.
D. The *Proceſſus Zygomaticus.*
E. The Membrane which was placed over the *Tympanum*, turn'd back, and mov'd out of its Place, to make it the more conſpicuous.
F. The *Tympanum* in its Poſition.
G. The oſſeous Proceſs of the *Malleus*, conſpicuous through the *Tympanum* unto which it adheres.
H. The bony Circle unto which the Membrane of the *Tympanum* is annexed.
I. The *Proceſſus Styloideus*, being cartilaginous. It has its natural Poſition upon the beforeſaid Circle, and is here a little remov'd out of its Place, to make it the more conſpicuous.

TABLE III.

Figure X. *repreſents an entire* Fœtus *of Nine Months.*

A. The *Os Syncipitis.*
B. The *Fontanella.*
C. The *Sinus Longitudinalis*, conſpicuous through the Membranes.
D. The Suture that divides the *Os Frontis* in Two Parts.
E. The *Os Temporum.*
F, F, F. The Protuberancies in the ſuperior *Maxilla.*
G. The Diviſion in the inferior *Maxilla.*
H, H, &c. The larger Articulations, being all of them as yet cartilaginous. The leſſer Ones both in the Hands and Feet are ſufficiently conſpicuous by their Blackneſs.
I. The ſmall Bones of the *Sternum.*
k, k, k, k, k, k, &c. Are Six Ribs bent upwards.
l, l, l, l, l, l, &c. Are Six Ribs bent downwards.
M, M. The Cartilage which ſurrounds the *Os Ilii.*
N, N. The *Os Ilii*, as we moſt generally call it. *Bartholin* calls it *Ileon*, and others give it another Name. (Moſt commonly it is call'd the *Os Ilium, ab Ilibus*, in the Plural Number;) being as yet diſtinguiſh'd from the Two other Bones of the *Os Innominatum.*
O, O. The *Os Pubis*, which in a *Fœtus* is diſtinguiſh'd from the other Two.
P, P. The *Os Coxendicis*, which is in a *Fœtus* diſtinguiſh'd from the other Two.
Q. One of the great *Foramina* in the *Os Pubis* and in the *Os Coxendicis.* The other could not be repreſented in this Figure, by reaſon of its Poſition.
R, R. The *Patella*, being as yet wholly cartilaginous.
S. The *Os Aſtragali.*
T. The *Os Calcanei*, ſurrounded on all Sides with a Cartilage.
v, v, v, v. The oſſified *Puncta* in the middle Articulation. Theſe are to be ſeen also in the right Foot.

Figure

Figure XI. *ſhews the* Os Occipitis *in a* Fœtus *of Nine Months.*

A. The Firſt Part of the *Os Occipitis*, to wit, the great triangular Bone, diſtinguiſh'd here in Four Parts, *b*, *b*, *b*.
B, B. The Cartilage which ſurrounds the *Os Occipitis*.
C. The Second Part of the *Os Occipitis*.
D. The Third Part of the *Os Occipitis*.
E. The Fourth Part of the *Os Occipitis*.
F. Shews the *Foramen* through which paſſes the Spinal Marrow.

Figure XII. *repreſents the* Os Sphænoides *in a* Fœtus *of Nine Months, being now united in One by Coalition.*

A, A. The Parts on the *Sella Equina*, as yet cartilaginous.
B, B. The *Foramina* which afford a Paſſage to the Optick Nerves.
C, C. The *Foramina* for the Paſſage of a Branch of the Fourth Pair of Nerves.

Figure XIII. *repreſents the interior Part of the* Os Temporum.

A. The *Os Squamoſum*, diſtinct from the *Os Petroſum* in a *Fœtus*.
B. The *Os Petroſum*.
C. The *Foramen* for the Paſſage of the Auditory Nerve.
D. The *Foramen* adjoining to that which tranſmits the Auditory Nerve.
E. The *Proceſſus Zygomaticus*.

Figure XIV. *repreſents a* Vertebra, *conſiſting of Three Bones, in a* Fœtus *of Nine Months.*

A. The Firſt Part, call'd the *Body*.
B, B. The Two lateral Proceſſes.
C. The *Foramen* through which paſſes the Spinal Marrow.

DOMINICK GAGLIARD, Profeſſor of Phyſick at *Rome*, his Anatomy of the BONES, illuſtrated by new Diſcoveries.

PART I.

IN the Introduction, the learned Author tells us, That the next following Tract is founded upon his own ocular Inſpection of the Bones, by which Scrutiny he at laſt diſcovered ſuch a Structure and Compoſition both in their exterior and interior Parts, as have been repreſented here: For after having ſpent much Time and Labour in mollifying the Bones by proper *Menſtrua*, by calcining and levigating them, with many other Experiments, he found indeed that they conſiſted of innumerable very thin Scales or Lamels, (ſuch as were firſt detected by *Malpighi*;) but being not ſatisfied thus, he took a Reſolution to ſearch all the publick Cœmetries or Burying-Places of *Rome*, and firſt of all pitch'd upon that of the *Lateran*, where, among the Fragments of the old Bones, which by reaſon of their Antiquity were become very ſoft and tractable, he met at laſt with a very old Skull, which having been (in all Probability) expoſed for many Years to the Injuries of the Air, he obſerved in it the *Laminæ* to be ſomewhat diſtinguiſh'd from each other. Looking upon this Skull as a proper Object of his Scrutiny, he took it

it along with him to his own Houſe, where, with the Help of a fine Needle, he did in the *Os Frontis* raiſe many of theſe Lamels, and by Degrees abſolutely ſeparate them. He obſerved them to be pervious, and provided with innumerable very ſmall Holes, and therefore went on in his Scrutiny, to ſee what it might be that had made theſe Holes, and at laſt, by proceeding with the utmoſt Caution in the Separation of the ſubjacent and ſucceeding Lamels, found that theſe ſmall Perforations were pierced through by other ſmall Bones, which join'd and kept them together, in the Nature of ſo many Pegs or Nails.

However, not being fully ſatisfied with the Firſt Experiment, though founded upon undoubted ocular Demonſtration, he went frequently to that famous Cœmetery of the Hoſpital of the *Holy Ghoſt*, where he obſerved not only many other Skulls to agree with the former in the ſame Structure, but the other Bones to be framed alſo after the ſame Manner; in all which, whatever he found worthy his Obſervation, he has inſerted in the next following Tract.

CHAP. I.

Of the Structure *or* Compoſition *of the* BONES *in general.*

THE Bones do, by the unanimous Conſent as well of the ancient as modern Anatomiſts, conſiſt of Two diſtinct Subſtances, or may be divided into Two Parts, *viz.* one exterior, which is ſolid and hard, and another interior, which being ſpongious and leſs ſolid, contains an oleaginous and ſolid Marrow, call'd commonly the *Medullium* of the Bone. The exterior Part being that which firſt of all offers it ſelf to our View, we will alſo treat of its Structure in the firſt Place; eſpecially ſince the true Knowledge of the external Part will open a Door, and lead us into the Scrutiny and better Diſcovery of the internal.

The moſt ſagacious and moſt celebrated Anatomiſt of our Time, (I mean the great *Malpighi*) was the Firſt that found out and diſcovered to the World that moſt admirable Structure in the Fabrick of the Bones, in Reference to their external Subſtance, to wit, that it was compoſed of innumerable ſmall Scales or thin Plates: For theſe are his Words, (*Lib. de Anat. Plantar.*) 'In the 'ſame Manner Nature proceeds in the Aug-'mentation of the Bones: The Bones of a 'Fœtus, but eſpecially the *Cranium*, ſhew us 'the Progreſs of the *Filaments*. Theſe are 'not exactly parallel to one another, but 'ſend forth here and there their filamentous 'Appendicles, which, by a mutual Con-'junction or Intertexture, form a Kind of a 'Net-work; the chief Interſtices whereof, 'and the whole Frame of the Fibres, 'are repleniſh'd and tumefied by an oſ-'ſeous Juice. As the Bones encreaſe by 'Degrees, new Plates or Tables of Fibres 'are ſuperadded to the former, each of which 'being agglutinated to the preceding oſſeous 'Lamel, gives the due Conſiſtency and Soli-'dity to the Juice. Each of theſe Lamels 'may be plainly laid open to the Eye, if 'you put the Bones into a long Maceration: 'For in this Diſſolution you may ſeparate 'the whole reticular Plates; and in an 'abortive *Fœtus*, the Beginnings of this re-'ticular Structure are evidently conſpicu-'ous in the *Cranium*." Thus far *Malpighi*.

Theſe beforeſaid Lamels or Plates are join'd or tied together, not only by mutual Contact, but alſo by Means of certain ſmall Bones, which being ſhaped like Nails, and deſign'd for the Connexion of the oſſeous Lamels, may not improperly be call'd oſſeous Nails or Pegs: Concerning the moſt artificial Structure of which, we intend to treat, after we have firſt given you an Account of the Fabrick of the Lamels.

OBSER-

OBSERVATION I.

Of the Lamels *or* Plates *which compoſe the exterior Subſtance of the* Bones.

From the Bones which have been mollified either by a long Ebullition, or by being expoſed for a long Time to the Injuries of the Air, may be ſeparated ſome very thin Parts, each of which, by reaſon of their Thinneſs, may not improperly be call'd *oſſeous Lamels*, *Scales*, or *Plates*, from their Reſemblance to them.

Their Figure is very different, according to the Diverſity or Neceſſity there appears in the Bones they compoſe. In the Bones of the *Cranium*, where they terminate at the Sutures, they are expanded and even; but in the *Os Femoris*, and in the other larger Bones of the Limbs, they are as it were circular, or approaching to a cylindrical Figure; but always ſuch as is proportion'd to the Configuration of that Part they are to compoſe.

Theſe *Laminæ* conſiſt of a different Matter, to wit, of expanded *nervous Filaments*, and of a certain *concreſſible Juice*, approaching to the Nature of a Plaiſter; by Means of which, theſe beforeſaid Filaments are conjoin'd, and converted into *Lamels*. Theſe Plates ſeem almoſt to be framed in the ſame Manner as the Plaiſterers make certain ſlender Partitions out of Cane or Reed, and Gyps or Plaiſter; as ſhall be ſhewn hereafter, not only in the *Cranium* of an abortive *Fœtus*, but alſo in a very old Bone of the *Femur* of an adult Perſon; in which this gypſeous and concreted Matter being drop'd away by Length of Time, has left the Expanſion of the Filaments plainly diſcernable to the Eye. Beſides this, theſe beforeſaid Filaments have a different Poſition, according to the Difference of the Bones: For in the *Cranium* they are propagated like *Radii*, as is apparent in the before-mention'd *Cranium* of the abortive *Fœtus*: But in the *Os Femoris* they run as it were parallel.

The Lamels thus framed, are every where full of ſmall Holes, into which are driven certain *Claviculi*, or Nails, which are fix'd within the Lamels after a different Manner, according as the Circumſtances of the Part requires, and are ſometimes more, ſometimes leſs in Number; the Structure or Figure of which ſhall be the Subject of the following Obſervation.

OBSERVATION II.

Of the Claviculi, *or* Nails, *which faſten together the beforeſaid* Scales *or* Lamels.

For the better and more firm Connexion and Union of the *Plates*, provident Nature has driven into them certain ſmall Bones, which having ſome Reſemblance to ſmall Nails or Pegs, or at leaſt being deſign'd for the ſame Uſe, to wit, to faſten and keep together, may therefore not improperly be call'd *bony Pegs* or *Nails*. Theſe, though they are all ſubſervient to the ſame End, do nevertheleſs differ one from another both in their Figure and Poſition: So that the Differences that are obſervable in the beforemention'd *Claviculi*, or Nails, muſt be accounted for by the Figuration and different Poſition.

For ſome of theſe are fix'd within the *Laminæ* in a perpendicular Line, ſome by an oblique Line, and many of them are bent into an Angle, and the reſt have ſmall Heads; all which Differences will be made more evident when we come to the particular Scrutiny of the Bones.

Concerning the Matter of which they are compoſed, and by what Means they obtain their Conformation, 'tis ſomewhat doubtful; but it ſeems moſt probable, that they are Productions or *Appendiculæ* of the Filaments that compoſe the Lamels, conjoin'd in a Bundle as it were, and inveſted and incruſtated with the beforeſaid concreſſible and oſſifying Juice, as may be gathered from various, and thoſe not deſpiſeable Conjectures.

The *Claviculi* thus framed, ſeem to have their Riſe or Origin ſucceſſively from the interior *Laminæ*, from whence they are obſerved to be propagated, and turn with their Points towards the more external Parts, in ſuch a Manner and Order as ſhall be ſhewn hereafter.

It is nevertheleſs much to be queſtion'd, Whether all the before-mention'd Differences of the *Claviculi* are connate with them, or whether they are produced in Proceſs of

Time, or whether the *Claviculi* which are perpendicularly, or thoſe which are obliquely fix'd within the *Laminæ*, have not changed their own native Figure? For the *Claviculi*, which are implanted in a perpendicular Line in the *Laminæ*, if they are prevented in their perforating of the next ſuperjacent *Laminæ*, by reaſon perhaps of their Solidity, and theſe at the ſame Time being neceſſitated by their own natural Motion, to extend and encreaſe in Length, doubtleſs in that Part which is the ſlendereſt and ſofteſt, as well as the weakeſt, in reſpect to the reſt, to wit, at the Point where the whole Force of their Increment is not only united, but alſo equal, and carried forward in a perpendicular Line, and meets with an equal Force to oppoſe it; theſe Parts muſt of Neceſſity be there dilated, and as it were tumefied: And by this Means, though thoſe perpendicular Ones were pointed at firſt, they are eaſily changed into thoſe that have Heads.

But the *Claviculi*, which are fix'd obliquely, if they meet with ſome Lamels that are harder than ordinary, and yet are to be perforated, if they are not ſtrong enough to extend themſelves directly forward, they muſt of Neceſſity ſuffer an Incurvation, and at laſt an Inflexion, at the Angle: For the extenſive Force of its Increment being carried on obliquely, its whole Strength does not with the ſame Force act upon or hit againſt the Lamels that are to be perforated, nor does it meet with an equal Reſiſtance: Whence it is, that thoſe Filaments of the *Claviculi*, which receive the greateſt ſhare of the Repercuſſion, give way and bend, and that more eſpecially in the ſofteſt and pointed Part, where theſe beforeſaid *Claviculi* turning more and more out of the Way of their Rectitude, by reaſon of the continual Preſſure made upon them by their own Increment, begin to bend into an Angle: And becauſe their extenſive Force cannot be carried on directly, by reaſon of the Alteration in the Streightneſs of the *Claviculi*, it muſt of Neceſſity exſert its Effects more betwixt the Surfaces of the *Laminæ*, than towards the Profundities of the *Plates* that are to be perforated; and conſequently the ſaid *Claviculi* extending themſelves betwixt the *Laminæ*, are incurvated into an Angle.

All this is not only demonſtrable by the Rules of Geometry, but may alſo be made evident to and by any Body by a mechanical Experiment.

Take a Piece of Board, the Surface whereof need only be very ſmooth on one Side, and adapt to this Surface Two Iron Plates one upon the other: This done, make Two Perforations or Holes on the oppoſite Side of the wooden Board, where it is not cover'd: Let one of theſe Perforations be made oblique, and the other perpendicular, to the ſaid Iron Plates, and that in ſuch a Manner, that theſe Perforations do not reach beyond one of theſe Plates: Then take Two Iron Nails, ſuch as are equal to one another in all Reſpects, and the Points of which are not over-hard: Drive theſe Two Nails gently with a Hammer into the beforeſaid different Perforations or Holes, till you think that their Points may be turn'd or bent; then take aſunder the Iron Plates that were put one upon the other, and take Notice of the Nails, where you will find that which was ſtruck in obliquely, to be incurvated into an Angle, and the other which went in perpendicularly, to be flat, or with an Head at its Point.

'Tis further to be obſerved, that though theſe ſeveral before-mention'd Kinds of the *Claviculi* do moſt commonly tend from the moſt interior Part to the exterior Superficies, they do not all exactly paſs through or into the ſame Number of the Lamels; for the perpendicular and the oblique being the longeſt, penetrate into a greater Number of the *Plates* than the reſt. On the other Hand, though thoſe with the Heads, and thoſe that are incurvated into an Angle, do not enter into ſo great a Number of the Lamels, they nevertheleſs tie and keep them the more firm and cloſe together.

OBSERVATION III.

Which ſhews in what Manner the beforeſaid Lamels *and the* Claviculi *are diſpoſed, in order to form the exterior Part of the* Bones.

The Bones being deſign'd and neceſſary for the Support of the Body, and to keep it erect, provident Nature has been very intent

tent upon the Framing of their Structure to the utmoſt Advantage. Hence it is, that ſhe has not thought it ſufficient to adapt the beforeſaid Scales to one another, by a mutual, cloſe, and perfect Contact, though that alone might have anſwer'd her End; as we ſee that Two Plates of a ſolid Subſtance, if they are exactly levigated, ſo as that every Point of the Surface may touch and adhere to one another, if united by an immediate Contact, are not to be brought aſunder without ſome Difficulty: But in order to render this Union the more firm and ſtable, ſhe has thought fit to make uſe of long Pegs or Nails, by which Means they are conjoin'd in ſo compleat and ſurprizing a Manner, that unleſs by the beforementioned artificial Preparations of the Bones, they can never be divided into the Parts that compoſe them: And how theſe Lamels and *Claviculi* are diſpoſed and ordered for their mutual Benefit, is to be the Subject of this Obſervation.

The before-mentioned Plates are moſt exquiſitely twiſted together, and embrace each other, being moſt exactly, and by a moſt exquiſite Symmetry plac'd one upon the other, as we obſerve it in the Bulbous-Roots, or in the Lamels of the Bezoar-Stone.

Being thus diſpoſed in their due Order, they are perforated by the oſſeous *Claviculi* in ſuch a Manner, that each of them (excepting thoſe at the Superficies) is tied and kept firm, not only by its proper and peculiar *Claviculi*, *i. e.* by thoſe that have taken Root there, but alſo by thoſe of the more interior Lamels, and may perhaps be placed in the following Order: As for Inſtance, we will take the *Os Frontis*, which may be adapted alſo to the other Bones. The *Claviculi* ariſing out of the innermoſt Lamel, *A*, do penetrate into and through many of the ſuperjacent *Laminæ*, *B*, *C*, *D*, lengthways; and again, the proper peculiar *Claviculi* of the next following *Lamina*, *B*, do alſo paſs through their ſuperjacent *Laminæ*, *C*, *D*, *E*, *&c.* and ſo with the reſt: So that the *Laminæ*, *B*, *C*, *D*, *E*, are connected and kept cloſe together, not only by different Kinds of the *Claviculi*, but alſo by ſuch as are placed in different Ranks.

I did tell you, excepting the Lamels on the *Superficies*, for theſe are deſtitute alſo of their proper *Claviculi*, or if they have any, they are plac'd the contrary Way, and proceeding from the external, *G*, muſt be fix'd toward the interior Plates, *F*, *E*, which is very dicffiult to be diſcover'd: For the Surface of the Bones being every Way very ſmooth, and no where rough, it would have been attended with great Inconveniencies, if theſe *Claviculi* had ſtuck out bevond the Surface of the Bones; for the *Perioſteum* being vellicated by their Aſperities, would have occaſion'd continual Pains.

The different Union of the Lamels may ariſe alſo from the Diverſity there is in the *Claviculi*; for the more they are pierced through by thoſe Nails that have Heads, *B*, or that are incurvated into an Angle, *D*, the more firm and ſtrong is their Union; as may be obſerved ſometimes in the Bones of the *Cranium*, in which, if we find thoſe headed or incurvated Nails to exceed the others in Number, the Lamels are very hard to be ſeparated entire, though you are never ſo careful in your Preparation; or, at leaſt, not without either breaking or tearing aſunder the ſaid *Claviculi*.

Betwixt the Lamels which are ſeparated from freſh Bones, (eſpecially in young Animals) you may obſerve a great Number of very ſmall Ramifications of the ſanguiferous Ducts, which ſerve to prevent the exceſſive Dryneſs of the *Laminæ*: But of this we ſhall have Occaſion to ſpeak more at large in another Place.

We ſhould perhaps alſo make an Enquiry into the Number of theſe *Plates*, *viz.* How many of them belong to each particular Bone? But this being a Thing that would require a vaſt deal of Time, and ſavouring more of Curioſity than of Uſefulneſs, we will leave it to the Scrutiny of others. It will be ſufficient for the preſent to know, That they are in a manner innumerable, and that their Number is either more or leſs, according to the Thickneſs or Thinneſs of the exterior Subſtance of the Bones.

OBSERVATION IV.

Of the Interior Structure *of the* Bones.

We are now come to the Structure of the interior Parts of the Bones, which as it is design'd for several Uses, so its Fabrick is contriv'd also different Ways.

The interior Substance of the Bones is every where pervious and spongious, and in some Parts resembles exactly to a Honey-comb. They consist of divers Sorts of Lamels, among which, Three are most observable, being the principal Ones, from whence some other subaltern Species have their Rise. The First are the *Corrugated Lamels*, the second the *Perforated* or *Sive-like Plates*, and the Third the *Reticular Laminæ*. The last of these being plac'd on the most interior Part, and as it were in the Center of the Bones, have a very artificial Intertexture. But let us proceed to give you a particular Account of their Structure.

OBSERVATION V.

Of the Corrugated Lamels, *and their* Fabrick.

So soon as the exterior Part of the Bones is taken off, the *corrugated Laminæ* immediately offer themselves to our View; which being not smooth nor expanded as those in the exterior Part of the Bones, but full of complicated Wrinkles and Prominencies, may very properly be call'd *corrugated* or *wrinkled Lamels*.

They have not any peculiar and determinate Figure, because they accommodate themselves to the Place they are to occupy; and therefore it is no Wonder if they differ according to the Difference and Diversity of the Bones. However, this Difference consists for the most Part in the higher or lower Elevation of these *Pleats* or *Wrinkles*, or in their greater or lesser *Tortuosity*.

Nevertheless there are Two Sorts of Differences observable in these *Laminæ*, arising from the Diversity of their Structure, (especially in the larger Bones of the Limbs): For those that are situated next to the exterior Substance, are observed to have more Wrinkles, and are perforated with a few and very small Holes only; but these that lie nearer to the interior Part, though they are not so much corrugated, they have more Holes.

Besides this, these Lamels do not appear to be so small as in the exterior Substance of the Bones, and therefore it seems very probable, by reason of their Thickness and Solidity, that they are composed of several other thinner Lamels; the more, because their Prominencies being firm and stable, 'tis very hard to imagine how they should consist of one single *Lamina* only; or if they are not formed out of divers other Lamels, they must be supposed to be stock'd and incrustated more than all the rest with a glutinous and concrescible Juice.

The beforesaid Prominencies are nothing else than the *Pleats* made by the Corrugation of these Lamels, and are either bigger or smaller, or more or less conspicuous, according as they are more or less corrugated; wherefore we will divide them into the *more corrugated* and the *less corrugated* Lamels; the first being placed near the external Substance, and the others in the innermost Parts.

Certain round and small Bones are also often observable in the *less corrugated* Lamels, which here supply the Places of the *Clavi-culi*: Of which, more hereafter in its proper Place.

OBSERVATION VI.

Of the Perforated Lamels.

'Twas not to be suppos'd, That any Kind of the *Laminæ* without Exception was proportion'd and qualified for the Structure of the spongious Substance of the Bones: Hence it was, that Nature thought fit to form certain Lamels, which were every where pervious, such as were every Way adapted to the Fabrick of these Parts, which therefore may be call'd *Pervious* Lamels, or else *Sive-like*, because they are perforated not unlike a Sive.

Immediately next to the *corrugated* Lamels are plac'd these *perforated Plates*, and the nearer they lie to the inner Part, the more Perforations they have; so that there is no considerable Difference betwixt these *Lamin-*

as well in reference to their Number, as to the Capaciouſneſs and Figure of their Holes; and thus they may be diſtinguiſh'd into ſuch as are *more pervious*, and thoſe that are *leſs pervious*: And among theſe *Laminæ* there being ſome whoſe *Foramina* are very like unto one another, in reſpect eſpecially of their Figure, theſe may be call'd *Laminæ Ordinatæ*; as on the other Hand, thoſe that have their *Foramina* variouſly figurated, may be call'd *inordinate*.

There is alſo another Difference obſervable in theſe *Laminæ*, to wit, when they are interwoven with the *reticular Lamels*, which is very difficult to be deſcribed or to be delineated, by reaſon of their vaſt Variety and Number; for theſe beforeſaid *Laminæ* are ſeldom ſeen to have the ſame Texture. In theſe *Laminæ* are to be ſeen alſo divers Sorts of ſmall Bones, which are here inſtead of the *Claviculi*; as we ſhall ſhew hereafter.

OBSERVATION VII.

Of the Contexture of the Reticular Scales.

The *reticular* Lamels were not placed by Chance in the Center of the Bones, nor without very good Reaſon; for as in their Intertexture they exceed all the other Lamels, it was but Reaſon that they ſhould be lodged in the innermoſt Receſſes of the Bones, where their ſpongious Subſtance might ſtand them in moſt ſtead.

They are call'd *Reticular*, becauſe their Contexture is fram'd in the Nature of a Net-work. Nevertheleſs theſe Lamels have not all the ſame Intertexture, for ſome are compoſed of broad, others of roundiſh Filaments; and after all there ariſes another Difference in theſe Lamels, from the mutual Implication of theſe broad and round Filaments: So that I have often obſerved one Part of *reticulated* Lamels to conſiſt of broad, and the other of round Filaments, which ſometimes appear moſt curiouſly interwoven with one another. The Differences in the reticulated Lamels, which ariſe from the various Conformation and Capacity of their *Foramina*, are innumerable.

The Filaments of the *reticulated* Lamels terminate in a moſt admirable ſpongious Compoſition, eſpecially in the larger Bones of the Limbs: Of which, more hereafter.

There are alſo certain diſtinct ſmall Bones to be ſeen betwixt theſe Lamels: Of which, in the next following Obſervation.

OBSERVATION VIII.

Of the ſmall Bones which conjoin the Laminæ *of the interior Subſtance, and in particular, by what Means the corrugated Lamels are join'd to one another.*

It being requiſite, that the internal Part of the Bones ſhould be every where pervious and ſpongious, for the Conveniency of their Functions, provident Nature has pitch'd upon different Ways of joining them together. The *corrugated* Lamels are conjoin'd by Means of their *Pleats* and ſome ſmall Bones, and the *cribriform* or *ſive-like*, and *reticular Laminæ*, by different Sorts of Bones.

The *Pleats* (as we told you before) ſeem to be nothing elſe but the *reduplicated* Parts of the Lamels, which are raiſed above the reſt by their Corrugation. Theſe alſo differ among themſelves, according to the greater or leſſer Diſtance of the Lamels that are to be conjoin'd.

The before-mention'd ſmall Bones are likewiſe different among themſelves, for ſome are formed in the Nature of round Pegs or Nails, without a Point; many others branch out into various Twigs, which are cut off; others are very ſhort, and others of various Figures. Theſe ſmall Bones are ſometimes round, and ſometimes flat.

I am of Opinion, That they conſiſt of very near the ſame Matter with the *Claviculi*, which are implanted in the external Part of the Bones, to wit, of the Productions of Filamets that frame and make up the Bones, and are incruſtated with the *concreſcible oſſeous Juice*. But they far exceed in Number the *Claviculi* of the external Subſtance, for they are plac'd ſometimes ſo thick and cloſe to each other, that they ſeem to form a ſpurious reticular Contexture; ſo that the real Structure of the Lamels is ſometimes ſcarce diſcernable.

Theſe

Theſe before-ſaid *Pleats*, as well as the before-mention'd ſmall Bones, ſerve not only to conjoin and faſten together the Lamels, but alſo are ſubſervient to the keeping a requiſite Diſtance betwixt them. What makes this very probable, is the very Way and Method Nature makes uſe of in the Conjunction of theſe before-ſaid Lamels: For it is very obſervable, that neither the *Pleats* of the *Laminæ*, (which in Effect could not be otherwiſe) nor the ſmall Bones, perforate the Bones they are to unite together: Whence it is, that of Neceſſity they muſt be conjoin'd only by one of their Extremities, (becauſe in the other they are implanted with their Roots) and that ſuperficially by the Means of that oſſeous Juice wherewith each of the *Laminæ* does abound; ſo that they not only unite the Lamels, but alſo ſerve inſtead of Tiles, to hinder the ſpongious Partitions and Cavities from being over-charged with the medullary Juice, and ſome other Humours, by which the before-ſaid *Laminæ* would be removed at ſuch a Diſtance from one another, as would prove noxious to the Bone.

I judge it to be paſt all Diſpute, after what has been ſaid before concerning the Structure of the Lamels, that the oſſeous Juice is extant here, and has its Share in this Union: Beſides that, the Obſervations made by the moſt celebrated *Malpighi*, (*Lib. de Anat. Plant.*) ſufficiently evince it. Nevertheleſs, for the better Proof of this Point, I will add an Obſervation of my own, I made upon a fractur'd Bone of the *Femur*, and its Coalition, it being not ſet exactly as it ought to have been. Near the fractur'd Place ſtuck a very tough and glutinous Subſtance, which appear'd on one Part as big as the Breadth of a Man's Finger, and doubtleſs was the oſſeous Juice tranſudated and concervated by Concretion; as was very evident by ocular Inſpection.

Some will perhaps be apt to enquire, what Figure theſe ſmall Bones are of that belong to the *Sive-like* Lamels, as well as thoſe that faſten the *reticular* Lamels; but there being ſo vaſt a Variety to be obſerved in relation to their Figures, upon the Separation of each of the Lamels, this is very hard to be determin'd: However we have made this Obſervation, and that very frequently, that the *perforated* Lamels are moſt commonly united by Means of the flat ſmall Bones, but the reticular Plates by the round Ones.

OBSERVATION IX.

Shewing how all the beforeſaid Parts are diſpoſed to frame the Meditullium *of the Bones.*

In the Compoſition of the internal Part of the Bones, Nature has not made uſe of the mutual Embraces of the Lamels as in the external Part; for this laſt Part being not altogether made or deſigned for its Stability and Solidity, but for ſome other Uſes, 'twas requiſite that its Diſpoſition ſhould be different from the former: But ſince this Part has its different Structure almoſt in every particular Bone, we will in this Obſervation content our ſelves with giving you an Account of that, which ſeems to be the moſt exact, the moſt orderly, and the beſt proportion'd.

The external Part therefore of the Bones being taken off, the Firſt that come in your Sight are the more *corrugated* Lamels, which being extended, moſt commonly, according to the Length of the Bone, have their Corrugations broadways; and being thus diſpoſed, they are for the moſt Part united together (as we told you before) by Means of their *Pleats* and Prominencies, and that ſo exactly, that they are ſcarce to be diſtinguiſh'd one from the other, and by this Diſpoſition and Connexion they form that Part which reſembles to a Honeycomb.

A little deeper are to be obſerved the *leſs corrugated* Lamels, and theſe being ſomewhat flatter than the former, are ſeldom conjoin'd by Means of the *Pleats* alone, but alſo by the Help of the before-mention'd ſmall Bones. In ſome Bones, but eſpecially in the Bones of the *Cranium*, the *Meditullium* is found to conſiſt only of the *corrugated Laminæ*, as ſhall be ſhewn in its proper Place.

Unto the *leſs corrugated* Lamels are next adjacent the *Sive-like*. Theſe are ſometimes ſeen to run circular, ſometimes to be expanded broadways through the Bone; and their Poſition differs moſt commonly in moſt Parts, being accommodated to the Place or Space they are to fill up. They are conjoin'd and united by ſmall *oſſeous Twigs*, which ſerve

ſerve here inſtead of the *Claviculi*; and of theſe they have more, the deeper they are plac'd inwards, and the more perforated they are: And theſe perforated Lamels are plac'd very cloſe to each other; yet ſometimes are alſo at ſome Diſtance one from the other, to wit, according as there is Occaſion for that Part of the Bone to be more or leſs ſpongious.

Laſtly, the *reticular* Lamels are the innermoſt of all, being alſo conjoin'd by different Ways, as we told you of the *perforated* Plates. They are faſten'd together alſo by their ſmall Bones, which are ſometimes to be found here ſo numerous, that they frame a peculiar confus'd and diſorderly Piece of Net-work.

Theſe before-ſaid Lamels do not always obſerve this regular Order and Symmetry in the Compoſition of the ſpongious Parts of the Bones, but are variouſly interwoven and twiſted within each other: Of which, perhaps more at another Time.

There are beſides this certain *Spongioſities* in the reticular Lamels, which being of an almoſt miraculous Compoſition, eſpecially in the larger Bones of the Limbs, we will refer their particular Deſcription to that Place where we ſhall treat of the Structure of the *Os Femoris*.

Much alſo might and ought to be ſaid concerning the Uſe of the Marrow; but ſince this cannot be done very well without entring upon a Deſcription of what is contain'd in theſe ſpongious Cavities, we muſt defer a more particular Account thereof to the Second Part of this Anatomy.

CHAP. II.

Of the Particular Scrutiny *of the BONES.*

'TIS now Time we ſhould come to a particular Scrutiny of the Bones, in which, without inſiſting upon the Controverſies raiſed by ſome Authors about their Number, we will divide the Skeleton into Three Parts, to wit, the *Head*, the *Trunk* of the Body, and the *Limbs*. The Head is that ſuperior Part or Region which is ſupported by the *Vertebra* call'd the *Atlas*; the *Trunk* is that whole Frame in which are lodged and preſerved the *Præcordia* and *Viſcera*; and the Limbs comprehend all the reſt of the Bones that are faſten'd to the Trunk.

But becauſe theſe Parts conſiſt each of many Bones, we will at this Time confine our Obſervations only to thoſe among them which have ſomething peculiar and worth our Obſervation in their Structure, and begin with the Head, and with the Structure of the *Cranium*.

OBSERVATION I.

Of the Structure of the Skull.

Though the *Cranium* conſiſts generally of many and variouſly figurated Bones, nevertheleſs their Structure is very near the ſame; wherefore we will limit this Obſervation to the *Os Frontis*, the Diſcovery of which will bring us at the ſame Time to the true Cognition of the reſt.

This Bone differs in its Figure, *A.* (*ſee Fig.* I.) Moſt commonly it is round, but ſometimes alſo oblong. It conſiſts of a double Table, to wit, the exterior, and the interior towards the Brain. But theſe Tables are compoſed of almoſt innumerable *Plates*, (*mark'd with* E.) which if they are raiſed a little, (as is obſervable in thoſe Skulls that have been for a long Time expoſed to the Injuries of the Air) they repreſent a *ſcaly* Lamel, eſpecially on the exterior Surface, where they are very ſmooth and equal, and the whole is covered and inveſted with a Lamel: But the Surface on the Inſide toward the *Cerebrum* is full of Furrows, being the Impreſſions made by the Veſſels that paſs that Way, which *Laminæ* are extended only to the Sutures. 'Tis obſervable, that in this Bone, as well as in all the reſt belonging to the *Cranium*, its whole Circumference is not inveſted with one Lamel, as it is in the *Os Femoris*, and in ſome other Bones; but that it has a double *Lamina*. The *Claviculi* by which theſe

theſe *Laminæ* are join'd one with another, are to be obſerved here, not only in a much greater Number than in any of the other Bones of the Body (proportionably), but as they are very conſpicuous, their Differences are diſtinguiſh'd the better: Beſides, it is very ſeldom that all the Four Sorts of the *Claviculi* are to be ſeen here in the ſame Number, for ſometimes the perpendicular and oblique Ones are much more numerous here than the reſt; as on the other Hand the *flat-headed* and *incurvated* at the Angles exceed the others in Nnmber: But thus much is certain, that thoſe Bones which contain the greateſt Number of the *flat* and *incurvated Claviculi*, are always the hardeſt. I had once a very old Skull, which notwithſtanding this could not be broken to Pieces with the Hammer. I had the Curioſity to ſeparate its ſuperficial Lamels in one Place only, (and that not without a great deal of Trouble) where I obſerved that Part to be covered all over with the *Claviculi*, incurvated at the Angles. I ſuppoſe the *Egyptian* Skulls mentioned by *Herodote* had abundance of theſe *Claviculi* in them; though at the ſame Time I very much doubt, whether this Hardneſs of the *Cranium* does depend alone on theſe incurvated *Claviculi*, becauſe they could not be incurvated unleſs they had met with a *Lamina* of an extraordinary Hardneſs; and therefore I judge it to be owing firſtly and chiefly to the extraordinary Firmneſs of the *Lamels*, and afterward to the incurvated *Claviculi*, which unite theſe ſtrong Lamels very cloſe together.

Theſe Differences of the *Claviculi* are much more conſpicuous in thoſe Skulls, which having been expoſed for a long Time to the Injuries of the Air, their *Plates* will fall aſunder of themſelves, than in thoſe that are either boil'd or prepar'd by a long Maceration in ſome Liquor; for in theſe laſt the *Claviculi* being not to be ſeparated without ſome Force, the *Claviculi* are either torn out by their Roots, or elſe are broken at their Points.

In this Bone is obſervable alſo a conſpicuous *Pit*, excurvated towards the Noſtrils, which ſometimes is found to be double, and divided by a Partition, (*ſee Fig.* III.) but not the Two Tables or *Laminæ* of the Ancients, and conſequently in the *Meditullium*, as a great many have believ'd hitherto: But betwixt the Lamels that are in the Inſide toward the *Cerebrum*, (and ſometimes alſo, but ſeldom, betwixt the Lamels of the exterior Table) I have met with it, where the before-ſaid Parts are dilated for a Cavity not unlike to a Purſe.

Next to the external Structure of this Bone we muſt take into Conſideration alſo its internal Part; I mean the *Meditullium*, P, (*ſee Fig.* III.) which, though it is ſometimes ſo much depreſs'd, that it is ſcarce diſcernable from the exterior Part, yet is moſt commonly ſpongious, and reſembles a Honeycomb.

This Part conſiſts moſt commonly of the *corrugated* Lamels, which differ little or nothing from one another, and are in their Prominencies ſo ſtrongly and cloſely united together by Means of a Glue, that it is next to an Impoſſibility to ſeparate them in freſh Bones without cutting or tearing aſunder the Corrugations. I had much ado to ſeparate them in a Piece of an old Bone, which had been calcined by Length of Time; and at another Time, in the *Cranium* of an Infant, I did ſeparate (but not without a great deal of Difficulty) a ſmall Piece of the *corrugated* Plates, without any conſiderable Dilaceration of the Prominencies: And becauſe theſe corrugated Lamels are conjoin'd only by their Prominencies, they form the Cells or Cavities in the *Meditullium*.

The ſaid Lamels being thus adapted to each other, are at the Sutures conjoin'd in a very cloſe and compact Union with the Lamels of the external Subſtance, where being entangled within each other, and their Terminations being unequal, and plentifully ſupplied and inveſted with the *concreſcible Juice*, they frame and form the acuminated Indentations.

'Tis hard to diſtinguiſh whether there are any *perforated* or *reticulated* Lamels alſo in the *Meditullium* of the *Cranium*, this Part being not ſo ſpacious here as in the *Os Femoris*, but very narrow: It is however my Opinion, That this *Meditullium* is deſtitute of the ſaid Lamels, becauſe in a great Number of Skulls, which I have opened and viewed, I could never meet with any; and, if we duly conſider the Structure of the Cells of the *corrugated* Lamels, are the only

that

that are adapted to and fitted for them: For theſe Cells and Concamerations for the moſt part have ſo exact a Similitude, Order, and Proportion, to each other, as ſeems not to proceed from the Union of the *Laminæ* of a different Kind. And though the *Meditullium* of the *Cranium* is not provided with theſe *perforated* and *reticulated* Lamels, they are often obſervable in the ſpongious Bones of the Head.

There are alſo divers Ramifications of the Veſſels diſperſed through the ſpongious Part of the *Cranium*, as alſo abundance of Fibrils, Glandules, Caruncles, *&c.* to examine the Uſe of which does not belong to our preſent Purpoſe. And here I cannot forbear to give you a brief Account of ſome Obſervations I have made upon the Skull of an abortive *Fœtus* of ſeveral Months after Conception, which will contribute not a little to the true Underſtanding of the Principle of the Production and Increment of the Bones: But ſince the Structure of all the Bones here are very near the ſame, I have pitch'd only upon the *Os Bregmatis* for our preſent Examination; of which, upon that Account alſo, I have given you an exact Delineation.

The central and very ſmall Part of this Bone, *A.* (*ſee Fig.* IV.) appears to be more hard and perfect than the reſt; from whence, as from a Center, almoſt innumerable *Bundles* (*Manipuli*) of Filaments are extended to the Sutures, which, though near their Origin they appear to be tortuous, and in ſome Parts ſeem to lie concealed under the oſſeous concreted Juice, nevertheleſs being more expanded, and ſlenderer near the Sutures, *B.* are propagated in a ſtreight Line as it were in the Nature of *Radii*.

Near this central Part, *A.* are obſervable alſo abundance of *oſſeous Areolæ*, diſperſed here and there, (*Theſe are expreſſed in the Figure by theſe ſmall and white Spaces, where you find no Letters.*) which are of an irregular Figure; and the more remote theſe *Areolæ* are from the Center, *A.* the more ſlender and unequal do they appear to be: And furthermore, where theſe *Areolæ* are ſo ſmall and unequal, the *Manipuli* of the Filaments are not ſo tortuous; ſo that it ſeems probable, that as theſe *Areolæ* encreaſe in Bigneſs, the Filaments are more inflected, or at leaſt that upon that Account they appear more oblique: And therefore it ſeems alſo very probable, that before theſe *Areolæ* are filled up, the ſaid Filaments are extended as it were in a ſtreight Line, as well at their Beginning, as they are at their Extremities.

By the Tortuoſity of the ſaid Filaments, but eſpecially where theſe before-mention'd *Areolæ* are not very equal and very well fill'd up, there is form'd a Sort of a reticular Contexture, which by the Inſtillation of the concreted oſſeous Juice, does diſappear by degrees, to wit, as the *Areolæ* are thereby render'd more equal and fill'd up: For theſe ſo often mention'd empty ſmall Interſtices are by the continual Afflux of the ſaid Juice contracted to ſuch a Degree, that there remains no more to be ſeen of them than a ſmall round Pit or Hole in the Middle: And this is the Reaſon why in the Figure this reticular Contexture is not diſtinctly to be ſeen, becauſe moſt of the *Areolæ* are there fill'd up and ſmooth; but this Network is much better to be diſcover'd in ſuch Skulls as are not ſo very hard, for in theſe the *Areolæ* are extant in a much greater Number, being not fill'd up as yet: And the empty *Areolæ* are in the ſaid Figure indigitated by ſmall blackiſh Spots.

From what has been ſaid we may draw this probable Concluſion, in reference to the Method Nature is pleaſed to make uſe of in the Formation of the Bones; for theſe *Areolæ* being nothing elſe than *Vacuities or Interſtices of the Filaments, which are fill'd up and made even by the concreted oſſeous Juice*, it ſeems very probable, that when all theſe Vacuities and Interſtices of the Filaments are fill'd up, there will be form'd one continued, white, even, and ſmooth Surface of theſe *Areolæ*, and ſo ſoon as the whole Frame of the Filaments is united and join'd together, and made even by the Intervention of the *oſſeous Juice*, it quite diſappears, and ſo we have perfect Bones, which are now come to their full Solidity and requiſite Hardneſs: So that from hence it is evident how the Bones have their Productions in the Beginning, as well as in their Progreſs: for firſt of all Nature produces in the *Cranium* of an *Embryo* the *Stamina* of the Filaments, which being afterwards by degrees tied together by their glutinons, or oſſeous Juice,

are formed into Lamels, which by their mutual and close Union produce the Bones; as has been shewn before.

The Beginning of the *Meditullium*, *A.* in the said Bone, is represented somewhat obscurely here under the osseous *Areolæ*, because it was impossible to distinguish them exactly in the Figure.

The other Bones of the *Embryo* seem to be formed also much after the same Manner, excepting that there appears some inconsiderable Difference in the Position of their *Filaments*; for the Texture of the Filaments of the *Ossa Femorum*, and all the rest belonging to the Limbs, as well as of the Ribs, is not framed so as to extend them in the Manner of the *Radii*, but so as rather to run parallel to one another, which, by the Intervention of the beforesaid glutinous osseous Juice, are consolidated into Bones.

OBSERVATION II.

Of the Structure of the Teeth.

The Teeth, which are the hardest of all the Bones in our Body, have been observed to consist of Two Parts; One of which invests all that Part, *A.* (*see Fig.* VI.) which stands above the Gums, and by its Whiteness and otherwise is a great Addition to the Accomplishment of a handsome Face. The other the interior, *C.* which is not distinct from the Roots, *B.* and seems in Men to be one compact Mass, which discovers not the least Signs or Tracts of its being a Composition of other Parts. But in the Teeth of some Brutes it is subdivided again into other Parts, which lie inclosed within each other in the Nature of Kernels.

The Structure of the Teeth, even in Men, seems to be different from what is observed in other Bones, because they have seldom any *Meditullium*, or spongious Part; and besides this, they are not to be separated into small Plates, which I can assert upon my own Experience, for I have made Trial of them by various Methods and frequent Preparations; and therefore I do not in the least wonder if some Anatomists have not thought fit to number them among the Bones.

The so much celebrated *Malpighi* has made his Discoveries concerning the Structure of the Teeth of Four-footed Animals, but especially in Calves, which are exactly and most curiously delineated in his Book of the Anatomy of the Plants.

In humane Teeth, the Structure of the interior Part, *C.* is very hard to be discover'd; for manage it as you will, calcinate it, macerate it in various dissolvent and emollient Liquids, cut it asunder in the Middle, levigate it, and view it with a Microscope with never so much Attention and Assiduity, 'tis not sufficiently discernable by the Eye, and therefore I am very free to confess, that the Fabrick of this Part of the Teeth seems to remain a Secret as yet to us, though its Structure is very obvious in the Teeth of Calves.

But the exterior Substance, *A.* (call'd the external or the innate Involucre by *Malpighi*) and its Structure, is very evident to the Eye.

This Part is very soft whilst the Teeth lie as yet concealed within their *Alveoli*; but after they break forth beyond them, it not only exceeds the other by far in Hardness, but also acquires such a Degree of Solidity, that sometimes it exceeds even Stones in Hardness; and 'twas doubtless upon this Account that it was plac'd on the external *Superficies*, to wit, that it might the better be able to resist the Strength of the solid Aliments in Mastication, and grind them the smaller; almost in the same Manner as we use to strengthen the keen Edges of such Instruments as are intended for hard and continual Workmanship, with the purest and hardest Steel.

They consist, (as I have observed in the calcined Teeth, *A. see Fig.* VI.) of innumerable strong Filaments, arising in the Nature of Hairs perpendicular from the *Superficies* of the interior Substance, *C.* some of which have also taken Root a little Way within the said Substance, *C.* They are disposed in so admirable an Order, that they seem to be exactly parallel to each other, and yet they are contiguous, being conjoin'd closely by that tenacious *concrescible* Juice; all which is much more conspicuous in the Teeth of Children, but especially in those call'd

call'd the *Molares*, or Grinders, before they are quite harden'd, and whilſt they lie as yet conceal'd within their *Alveoli*: but they muſt be macerated till you ſee many ſmall Fiſſures in them, which will happen the ſooner, the oftener you moiſten them.

This Structure of the external Part is not only beſt adapted to their Function, in reſiſting the Solidity, but alſo in grinding of the Aliments; but alſo may be ſooner repaired in caſe ſome Part of it ſhould be loſt or broken off in chewing of the ſolid Aliments; becauſe the lapideous Juice which comes from the internal Part, may much ſooner be tranſmitted through the Filaments, and their inviſible Pores, than if theſe Filaments had been interwoven with one another into one confus'd Contexture: And though it be abſolutely neceſſary, that this glutinous Juice be divided into moſt minute Particles, in order to enable it to take its Paſſage through the beforeſaid Interſtices and ſmall Pores, yet does this not in the leaſt incapacitate it from affording Nouriſhment to ſuch ſolid Bodies as the Teeth are; for the more minute the Particles that are to be adapted are, the more cloſe and firmly they adhere and are apponed to the Parts that are to be nouriſhed; as is apparent by innumerable Experiments; and Reaſon it ſelf convinces us of the Truth of it.

I have alſo obſerved, That if you ſtrike the Teeth and a Piece of Steel together, they will, eſpecially on their external Involucre, emit Fire juſt as Flints do; ſo that this is not a Thing peculiar only to the Lion's Teeth, as ſome Naturaliſts have believ'd it was: And this may ſolve alſo the Phenomenon that has been taken Notice of in ſome Perſons, that have ſpitted Fire out of their Mouths, which might be a Contrivance either by the mutual Attrition of the Teeth, or by their Coaliſion againſt ſome other ſolid Body that is very ſuſceptible of Fire

There ariſes beſides this another Queſtion, to wit, Whether the Teeth are formed in the Child from the Beginning, like the other Parts are, or whether they are not produced till after the Formation of the reſt? This Doubt is ſoon ſolved, if we only take a View of the tender Mandibles in the abortive *Fœtus's*, in which they are found incloſed and concealed within the *Alveoli*, though very ſmall and friable; as I can teſtify by my own Experience: Nay, even their very Beginning and Increment affords us no ſmall Matter of Admiration; for at the Beginning there appears not the leaſt Sign of their Roots; but in that Part, where they ſhould be, you will find a ſquare Place, mark'd with *C.* (*ſee Fig.* V.) but in the oppoſite Part, *A.* to wit, where they uſed to break forth out of the Gums, there appear ſome ſmall acuminated Prominencies, which are protuberating, eſpecially round the Edges, leaving an intermedious ſmall Cavity betwixt them, which when it is fill'd up, as in the Part *D.* then the Root *E.* begins to ſprout out, and is propagated at firſt in the Nature of a *Tubulus*, which is not perfectly round, but as it encreaſes in Length, is ſubdivided into other ſmaller *Tubuli*, *G.* and the further they are extended, the more diſtinct they appear to be, till at laſt they are formed into perfect acuminated Roots, *H.* So that Nature ſeems to proceed by a prepoſterous Way in the Generation of the Teeth, becauſe the Roots, which otherwiſe are the Firſt, appear laſt of all in the Teeth. What has been ſaid concerning the *Molares*, or *Grinders*, may be applied alſo to the reſt, they being all produced (allowing for their Proportion) in the ſame Manner and Order.

OBSERVATION III.

Of the Conformation of the Ribs, *and of the* Cartilages.

Theſe Bones being deſign'd for a Fence and Guard to the more noble *Viſcera*, and the Heart the Principle of Life, have deſervedly obtained the Name of *Coſtæ*, *a Cuſtodiendo*, *i. e.* to guard. Theſe are ſolid and firm at their Origin, where they are articulated with the *Vertebræ*; but in their Progreſs they grow thinner and thinner, till towards the *Sternum* they become very flexible, eſpecially the ſpurious Ones, and thoſe that are next to them; which ſeems highly neceſſary, conſidering that the *Thorax*

requires a conſtant Dilatation and Conſtriction, by its continual Inſpiration and Exſpiration.

They have alſo, beſides their exterior Part, a *Meditullium*. Their external Part is fram'd out of very ſmooth Lamels, each of which inveſts the whole Circumference, and is enjoin'd by the Means of its proper *Claviculi* (which are however not ſo thick nor ſo incurvated as in the *Cranium*): But the Structure of the *Meditullium* is obſerved to conſiſt of the *perforated ſive-like*, and ſometimes alſo of the *reticular* Lamels; but theſe are not implicated together all over the Cavity, eſpecially in the more flexible Part, but plac'd there after a peculiar Manner. And though they are not always the ſame in their Poſition, nevertheleſs for the moſt Part, (eſpecially the *corrugated* and *perforated* Lamels) they are ſo diſpoſed, as to divide that Cavity into many Parts lengthways; but in that Part where the beforeſaid Lamels are articulated with the *Vertebræ*, they are twiſted within themſelves as it were in a circular Figure.

It is very remarkable, That in the exterior Subſtance of the Ribs there are not only ſanguineous Ducts, but alſo that in the ſoft and more flexible Part they are both larger and more conſpicuous than in the other Bones; which, that it is owing to the Want of Solidity in that Part, which does not confine ſo cloſely the Dilatation of the Veſſels, as the more ſolid Bones do, ſeems to be very conſonant to Reaſon. Neither is it to be queſtion'd, but that this Conſtitution of the Veſſels contributes very much to the Preſervation of their Softneſs and Flexibility; for by this Capaciouſneſs of the Veſſels, the ſaid Part is much more conveniently ſupplied and irrigated with the ſerous Humour, which retards or prevents the total Induration of the concreſcible Juice, becauſe Bones, and eſpecially the Ribs, if macerated in Water, become ſofter.

But the Cartilages, though they ſeem to be ſomewhat harder and more compact than the Membranes, nevertheleſs in their natural State they do not arrive to the Hardneſs of the Bones.

'Tis true, the Cartilages in their very Beginning are provided with a Contexture of Filaments, not unlike to that of the Bones: But becauſe they are irrigated by a Humour which is not concreſcible, and has nothing of a glutinous Nature, hence it is, that they cannot adhere ſo cloſe to one another, nor arrive to that Pitch of an oſſeous Solidity, unleſs in a morbifick State. But when the Cartilages are indurated preternaturally, (for according to their Nature they ſhould not be ſo) or become oſſeous, this muſt be aſcribed to Two Cauſes, either when in a very decrepit Age their *ſerous Humidity* is quite conſumed, and ſo they are dried up, and become hard, and repreſent or degenerate into the Nature of ſpurious Bones; or elſe, becauſe the *oſſeous Juice* is either produced or elſe introduced there, and ſo the Cartilages may degenerate into Bones; and conſequently this Change may happen to thoſe of a middle Age, as well as to decrepit People: And the ſame Reaſon may ſtand good, and ſeems to be applicable to other Parts that are oftentimes tranſmuted into Bones; (of which, there are almoſt numberleſs Inſtances in the Authors:) For the *oſſeous Juice*, ſo ſoon as it is generated in ſome Part, or transferr'd into and ſeparated in another Part, is by its natural Activity firſt diſperſed through it, and afterwards agglutinated to it, till at laſt it produces a ſolid Body by its Concretion: For the Fibrils being inveſted and incruſtated with this concreted Juice, do not only adhere cloſe to one another, and are tied moſt firmly together, but alſo become rigid and inflexible; and thus that Part degenerates into a Bone.

Neither are the Cartilages only apt to aſſume an oſſeous Nature; but what is more, there are alſo not wanting Examples (related by the Authors) of Bones being turn'd into a cartilaginous, nay, even into a much ſofter than a cartilaginous Subſtance: Of this I ſaw my ſelf an Inſtance, which happen'd but lately, and being not mention'd as yet by any one (as far as I know), I will here inſert a brief Account of it.

'A Lady of noble Extraction, in the 'Flower of her Age, but of a very ill Ha- 'bit of Body, (having been a conſiderable 'Time afflicted with Rheumatical Defluxions) about Two Years ago found theſe 'Pains to afflict her by Intervals, with 'much

'much more Violence than ever, ſo that 'by degrees theſe tormenting Pains be-'coming habitual, the poor Lady was re-'duced to a moſt miſerable Condition. 'At length her Legs and Feet beginning to 'ſwell, the Severity of the Pain ſeem'd to 'be ſomewhat abated; but ſaw her ſelf not 'long after ſurpriſed by an almoſt ſtupen-'dious Accident, for the Bones began not 'only to be incurvated of themſelves, but 'alſo to be disjointed, ſo that ſhe could 'neither ſtir nor move; and the Pains re-'turning with the ſame Violence as before, 'ſhe linger'd on her miſerable Life for ſome 'Time in this doleful State, till at laſt be-'ing deprived of all her Strength, and 'quite emaciated by an intermittent Fever, 'and afflicted at the ſame Time with an '*Aſthma*, occaſion'd by the Compreſſion of 'the Breaſt, by the Ribs being incurvated 'inwards, ſhe gave up the Ghoſt. Her 'Body being open'd, all the chief Bones of 'the inferior as well as the ſuperior Limbs 'were found mollified to ſuch a Degree, 'that they ſeem'd to be made up only of 'ſome callous Fleſh, and all the other Bones 'of the Body were like a cartilaginous Sub-'ſtance.

This Mollification of the Bones may eaſily be explain'd from what has been ſaid concerning the Compoſition and Structure of the Bones, to wit, becauſe the Concretion of that tenacious and glutinous *Juice*, by which not only the fibrous Contexture of the Bones is form'd into Lamels, but which alſo gives them their Solidity, is firſt mollified, and quite diſſolved at laſt; for the Filaments of the Bones being depriv'd of the before-mention'd glutinous or *oſſeous Juice* by its Diſſolution, looſe their Rigidity, becauſe they were ſoft and flexible in their own Nature; ſo that now they return to their native State ſo ſoon as the Cauſe of their Solidity and Hardneſs ceaſes: And thus the Bones muſt of Neceſſity be mollified, and that either leſs or more, according to the greater or leſſer Degree of the Diſſolution of this *concreted Juice*. But how and by the Means of what Diſſolvent it is that this *coagulated Juice* is reduced thus again into its moſt minute Parts, without cauſing any Alteration in the fibrous Part of the Bones, very well deſerves a particular and ample Scrutiny: But ſince ſuch a compleat Dilucidation cannot be attempted without a great many previous Obſervations, which would far exceed the Limits we have preſcribed to our ſelves in this ſmall Treatiſe, it will be ſufficient to give only ſome Hints, which may in ſome meaſure contribute towards the Solution of this Queſtion.

'Tis beyond all Diſpute, that the Bones are not always of the ſame Solidity and Firmneſs, which Difference ariſes doubtleſs from the different Degree of the Coagmentation and Conſolidation of the *glutinous Juice*: And for the ſame Reaſon it ſeems very probable, That the Softneſs of the Bones, and which do not come up to the full Degree of their natural Solidity, are ſuch as conſiſt of an oſſeous Juice, that wants a ſufficient Coagmentation and Concretion.

Thus it happens in Rheumatick and Arthritick Pains, eſpecially if they owe their Origin to the *French* Diſeaſe, where the *Lympha*, and ſome other Humours of the Body, but eſpecially thoſe that irrigate the Joints and the Bones, contract an Acidity and Acrimony.

From what has been ſaid we may eaſily account for the beforeſaid Mollification of the Bones; for the *Lympha*, and the other before-mention'd Humours, which have contracted an Acidity and Acrimony, being, together with the Blood, diffuſed through the Subſtance of the Bones, are very apt to mollify, diſſolve, and reduce into minute Particles, the alcalious, glutinous Subſtance, if it be not arrived to its full Concretion; as we ſee Pearls, Corals, and ſome other Things which are of a much harder Subſtance, to be diſſolved in acid and acreous Liquors.

Neither does it in the leaſt imply a Contradiction, that the ſaid *Juice* ſhould be diſſolved without any Eroſion of the Filaments; for beſides that there are certain Diſſolvents which diſſolve only one peculiar Part of a compounded Body, without affecting any other, there is another, and I am apt to believe a much more probable Reaſon to be given for this; for the Fabrick of the Filaments is not diſſolved, in ſo far as the *Energy* of the diſſolvent Humour is

not

not arrived to ſuch a Degree, as to be ſufficient for the Comminution or Diſſolution of it; for were it otherwiſe, it would corrode the Filaments here, as well as it does in the *Caries* of the Bones; whereas the beforeſaid *concreted Juice* was eaſily diſſoluble, becauſe it had not attained as yet to its requiſite and full Coagmentation and Concretion; beſides what might be alledged here, of the *Gramen Oſſifragum*, of the *Succus Cicutæ*, and ſome other Liquids, by which, as ſome will have it, the Bones are mollified without any manifeſt Acidity or Acrimony. But 'tis Time to return to the Cartilages.

The Cartilages being either expoſed to the Sun for a conſiderable Time, or elſe dried by the Fire, will ſeparate themſelves into Membranes; ſo that their whole Structure ſeems to be a Compoſition of Membranes, which are moſt firmly united with one another by the Means of ſome fibrous Appendicles, which here are inſtead of the *Claviculi* in the Bones, and perform the ſame Office, to wit, that of tying them together; but nothing certain is to be determin'd concerning their Figure, Longitude, and Poſition, they being very friable, and not ſufficiently diſcernable.

OBSERVATION IV.

Of the Conformation of the Vertebræ.

Among the ſpongious and light Sort of Bones of the Body, the *Vertebræ* may very well challenge their Place, their exterior Part, which is very thin, being inveſted only with a few Tunicks as it were of the *Plates*, which are conjoin'd by Means of the *perpendicular* and *oblique Claviculi*, which are very ſhort, and diſpoſed in the ſame Manner here by Nature, as in the before-mention'd other Parts.

But their interior Subſtance conſiſts of the *corrugated*, *ſive like*, and *reticular* Lamels. The *corrugated* Lamels are but few in Number, and do not fill up the whole Circumference of the Space that is to be fill'd up, but lie ſcatter'd and intermix'd with the others. The other Two being more numerous, are interjoin'd and intermix'd with one another, and make up the whole Cavity; but diſpoſed in a very irregular Manner, ſo as to form many Cells and Concamerations, which have no great Reſemblance to one another.

The exterior Part of each *Vertebra* has many *Foramina*, differing from one another in Magnitude, many of which tend directly to the Ducts, that are conſpicuous in the Middle of them: For in the Middle of each *Vertebra* are Two and ſometimes more ſmall Ducts or Channels, which at laſt uniting into One, terminate in a large and broad Perforation, of a quadrangular Figure, which affords a free Egreſs to the Cavity of the Spinal Marrow. Through theſe *Foramina* and the Channels many Ramifications of the ſanguiferous Ducts take their Courſe, ſuch as are requiſite and neceſſary for the Nutrition of the Part.

This *Foramen* of the *Vertebræ* is ſometimes obſerv'd to have an oſſeous Partition, which divides it into Two oblong Holes, which oftentimes are ſo ſtreighten'd by the *Periоſteum*, that there is ſcarce any Room left for the Paſſage of the ſanguineous Ducts; which being very numerous, but at the ſame Time very ſmall, go towards the Spinal Marrow. Sometimes the ſaid quadrilateral *Foramen* is quite ſhut up by an expanded Membrane, (being a Production of the *Periоſteum*) and ſometimes a ſmall Caruncle is plac'd juſt near it, which receiving the Divarications of many Veſſels, ſeems to be (in my Opinion) deſign'd for ſome beneficial Function.

Nature did not produce ſo great a Number of Veſſels in the *Vertebræ* without ſome ſingular Uſes; for conſidering that here is performed the Secretion of ſo uſeful a Juice, there was Occaſion for a continual and copious Supply of Blood: Concerning the Nature and Secretion of which Juice, and the Secretory Organs, many Things no leſs curious than uſeful might be added here; but being of ſuch a Nature, as require to be examin'd into, and confirm'd by various and reiterated Experiments, we will defer the further Dilucidation thereof to a more convenient Opportunity. It will be ſufficient at this Time to put you in mind, how careful provident Nature has ſhewn herſelf in the Structure of theſe ſpongious Parts of the *Vertebræ*, which are ſuch as to afford all poſſible Conveniency for thoſe various Veſſels that perform the Secretion and Filtration,

Filtration, to perform their Functions in these Cells and Concamerations without any Obstacle or Difficulty; which could not have been done with the same Ease and Conveniency, had the Structure of the *Meditullium* been contrived otherwise than it is.

OBSERVATION V

Of the Structure of the Os Ischii.

The *Coxendix*, as well as all the other Bones which form the Cavity of the *Pelvis*, do not vary in their Structure from that of most of the other Bones of the Body; for on the anterior Part they are covered with smooth and expanded *Lamels*; but their *Meditullium* consists of *corrugated, sive-like*, and sometimes also of *reticular Plates*; tho' in this Part they are oftentimes plac'd at a somewhat greater Distance from one another than in other Bones: Whence it is, that their *Meditullium* is also more spongious and open.

But though there be nothing worth our particular and peculiar Observation in the Structure of this Bone it self, yet in its *Acetabulum*, where it is articulated with the *Femur*, there lies concealed so miraculous a Contrivance of Nature, as very well deserves our particular Attention; for the said Cavity is made pervious by Nature by many *Foramina*, which, notwithstanding they are cover'd by a cartilaginous Tunick, as also by that of the *rotund* Ligament, yet it seems very reasonable to believe, that there is instill'd something into this Cavity from the exterior and spongious Part; especially if we duly consider the strong Action of this Articulation, the Confrication and vehement Circumrotation of the Extremities of the Bones, which doubtless implies and produces a certain Secretion and Expression of some fluid Matter. Nature has thought fit to provide for the Exigency of this Part in the best Manner that could be; for this Articulation being more frequently used, and with more Force than any of the rest when we are walking, lest it should contract so great a Degree of Rigidity, and become quite dry, was to be irrigated not only by a Lymphatick, but also by a Kind of oleaginous Serosity, which gradually is supplied from the spongious Part, and transmitted through the said *Foramina*, and that in a greater Quantity than in the rest of the Bones; whereby also the Ligaments being moisten'd, might be preserved in their Flexibility. Hence it seems also obvious, why this Part is so frequently excruciated with such tormenting and contumacious Defluxions; for when this Serosity is separated and discharged from the Vessels, and the beforesaid *Foramina* upon the Ligaments, they are distended, and tumify; which excessive Distention causes most intolerable Pains, especially if the Humour happens to stagnate there, and contracts an Acidity and Acrimony.

OBSERVATION VI.

Of the Structure of the Os Femoris, Tibiæ, *and* Fibulæ.

The *Ossa Femoris*, *Tibiæ*, and *Fibulæ*, are doubtless design'd for the Support and Strength especially of the inferior Limbs. These, though they vary in their Magnitude, Thickness, and Figure, nevertheless in their internal Composition are in some Respects in a certain Proportion, and in some Measure also in their Contexture or Structure not different from one another. And for this Reason it is, that we will confine our present Scrutiny and Description to the *Os Femoris*, the true Understanding of which will at the same Time bring us to the Cognition of the Structure of the rest.

The *Os Femoris* may very well challenge the Precedency before all the other Bones of the Body, not only by reason of its Magnitude, Thickness, and Strength, but also in respect of its Function, being that which, like a Foundation-Pillar, supports the whole Fabrick of the Body; and therefore Nature has thought fit to render its Structure almost miraculous, by a Contrivance that surpasses all humane Art: But before we can propose to our selves to be fully satisfied as to this Point, we must separate the exterior from the interior Part of this Bone.

The external Substance therefore of the *Os Femoris*, *A.* (*see Fig.* XIV.) is very thick, compact, and hard, being for that Reason of Necessity invested with many Lamels, *B.*

Neither

Neither are the Lamels of this Part, *B.* ſo thin and ſlender as they are in other Bones, but ſomewhat thicker and more compact, being adapted to one another almoſt in the ſame Nature as we find in the Stalks of Leeks, their Tunicks placed and diſpoſed upon one another. They are united alſo with one another by more ſolid and longer *Claviculi*, *C.* which are for the moſt part either *oblique*, or incurvated at their Angles, being ſuch as by their Structure are moſt of all conducing to the Strengthening of the whole Compoſition of the Part.

Neither is the beforeſaid Part always and every where alike in its Solidity, Hardneſs, and Structure; not always, becauſe ſometimes it is obſerv'd to be thinner and leſs ſolid; not every where, becauſe its Head, and where it is articulated with the *Os Iſhii*, is cover'd with a very thin and ſomewhat ſoftiſh Subſtance, which in young Children, before their *Epiphyſes* are conſolidated, is inveſted with a Kind of a cartilaginous Tunick: Likewiſe the inferior Extremity, *I.* which is articulated with the *Tibia*, is alſo not only cover'd with a thin Membrane, but alſo in a manner porous with many open *Foramina*, *G.* which ſerve for the Tranſudation of the medullary, oleaginous, excrementitious Juice, as we may rationally conclude, as well from the Structure of this Part, as from the Uſefulneſs of this Humour: For this Efflux, as well as the Afflux of this excrementitious Humour, is of ſingular Benefit to the Part; ſince it not only frees the Marrow of its ſuperfluous Seroſity, but this ſerous Humour being impregnated with abundance of oleaginous Particles, contributes very much to the eaſy and convenient Motion of the Joint.

After you have clear'd the Bone of its external Part, the interior and ſpongious Part offers it ſelf to your View: But this is not to be obſerved in every Part, or all over the whole ſpacious Cavity of this Bone, as it is obſervable in moſt of the other Bones; but it is only near the Extremities, leaving an intermediate Space in the great Cavity, in which the more ſolid Subſtance of the Marrow is reſerved for its further Uſe.

In the Compoſition of this ſpongious Part, Nature moſt commonly makes uſe of Three Sorts of Lamels, (*See Fig.* XIV.) to wit, the *corrugated*, *D.* the *ſive-like*, *E.* and the *reticulated*, *F.* The Two laſt of theſe are interwoven in ſo confuſed a Manner, that from this Intertexture there ariſe ſeveral other ſubaltern Differences of theſe *Laminæ*; of which we have had Occaſion to ſpeak more at large heretofore: And hence it is alſo, that the ſaid Spongioſities vary moſt frequently one from the other.

We have given you an Account before in what Manner the Lamels are diſpoſed to form the regular Spongioſities; ſo that it ſeems to belong only to our preſent Purpoſe to make an Enquiry into the Fabrick of the irregular and inordinate Spongioſities: But this being a Thing involved in no ſmall Difficulties, and not to be repreſented without a great Number of Figures or Delineations, it will be ſufficient to obſerve in this Place, That the ſaid Variety which is obſervable in theſe Spongioſities, is owing to the different Poſition, Diſtance, and Union, of the Lamels, as alſo of the different Kinds of the ſubaltern Lamels. But notwithſtanding theſe before-mention'd Spongioſities conſiſt of very different Lamels, yet the Structure of the oſſeous Cells and Concamerations are always obſerved to be proportionable and accommodated to the Exigency of the Part.

Beſides theſe Lamels which form the Spongioſities, there is oftentimes obſervable another moſt wonderful Contexture, which is various alſo, and differs according to the Diverſity of their Lamels; for ſometimes, (*See Fig.* XIV, XV, XVI.) it repreſents a Heap or Bundle of Roots, ſometimes, *C.* it appears like an Intertexture of Filaments, informed like a reticular Involucre, and oftentimes, *B.* reſembles to a Heap of Buſhes or young Twigs, and at other Times they are diſpoſed alſo after a very confuſed Manner: But it happens but very rarely that this Contexture is quite wanting; but when it is ſo, then this beforeſaid ſpongious Part of the *Os Femoris* is compoſed only of ſome rude and undigeſted corrugated Lamels; whereas otherwiſe, when its Contexture is made up of *reticular* Lamels, conſiſting of round Filaments, this before-mention'd Contexture is found to be the more nice and exactly contriv'd.

There are alſo ſeveral other Differences ariſing from the various Poſition and Situa-

tion

tion of these Spongiosities; for sometimes they are plac'd so deep inwards, that they do not appear till after the reticular Lamels are removed, as it is observable in the 14th Figure; and when they are thus situated, they occupy also a greater Space. Oftentimes they are with their small Filaments inserted into the Extremities of the Lamels, and propagated through the hollow Receptacle of the Marrow, as in Figure XV. but sometimes they are seated only at the beforesaid hollow Space breadthwise, as in Figure XVI. but not through the whole Cavity, but only at its Extremities, and near unto the spongious Structure, which consists of the beforesaid Lamels: And after all, Nature does sport very frequently in the different Disposition of these Spongiosities.

The beforesaid Spongiosities deduce their Origin either from the most interior Lamels, or from the Terminations of these interior, not only, but also of the other Lamels of the *Meditullium*; as also from the external Substance it self, where they are fixed and have their Roots, as in Figure XVI.

The Variety of the said Spongiosities are much more apparent when the Marrow is quite dried up or consumed, as in antiquated Bones; in the Choice of which, you must always have a Regard to their Outside, whether it be white and smooth; for the whiter and smoother, and the brighter, you observe the external Surface of the Bones to be, and the lighter they feel, the more nice and exact you will find their interior Contexture.

These beforesaid various Structures of the Spongiosities are not only thus contriv'd in adult Persons, but also in the abortive *Fœtus's*, when their Bones are as yet cartilaginous.

Concerning the Use of both the spongious Parts, it is not at present to our Purpose to enter upon it, because this Enquiry belongs to the Secretion of the Marrow: But we must not neglect to add something in relation to the Propagation and Passage of the Vessels.

In the external Part of this Bone are observable many *Foramina*, through which the sanguiferous Vessels are propagated to the interior Substance. There seems to be a Twofold Reason for their being form'd near the Extremities, because the Organs that were adapted to the Secretion of the Marrow lie hidden in the Extremities of the *Femur*; and since it was to be separated from the Blood, 'twas requisite that the Blood should be carried thither by the shortest and most commodious Way; as also that the Blood in its Reflux (because in such a Part it moves but slowly) being propell'd by the Motion of the Joint, might be circulated with the more Conveniency. 'Tis true, about the Middle of the *Femur* also there are Two, and sometimes Three large *Foramina*, where these Vessels have not the Advantage of the beforesaid Propulsation of the Joints in their Passage: But here Nature has made use of another Contrivance to promote the said necessary Circulation of the Blood; for in some of these *Foramina* I have sometimes observed the Veins and Arteries to be inclosed in one common Membrane, like unto one membranous *Tubulus*. This was not done without a peculiar Occasion or Necessity; and doubtless for no other Reason than that by the Motion of the Artery, the Reflux or Regress of the venous Blood (which is but of a slow Motion) might be encreased or advanced. But of this most excellent Contrivance of Nature we shall have Occasion to speak more at large at another Time, when we shall treat of the Circulation of the Blood through the Bones.

But before we conclude this Observation, we will insert one Instance of the *Os Femoris*, in its vitiated and morbifick State, there being something in its Structure that is very well worth our Observation.

This beforesaid Bone I met with a good many Years ago in the Church-yard of the Hospital of *Consolation*, in the Middle whereof there was a Tumour very conspicuous, the external Surface of which was indeed very hard, but yet appear'd not to be altogether the same with the genuine Substance of a Bone, it being all over rough, unequal, and without any Appearance of the Beginnings of the Lamels, but like one rude Mass of a compact glutinous Substance, and on the Inside had a confused and inordinate Spongiosity, which seem'd for the greatest Part to consist of the Fragments of *corrugated Lamels*, very confused, and disposed

without any Order or Symmetry; all which did doubtleſs ariſe from the Fracture of the Bone, which had been ill managed in the Cure: For this Bone had not only a preternatural Contortion, but alſo there ſtill appear'd ſome obſcure Marks or Signs of a Fracture, and the glutinous or oſſeous Juice flowing continually out of that Part of the Bone, where it was not well ſet or adapted together, and ſettling there, might eaſily by Concretion turn into a Tumour.

This Obſervation leads us not only to the Cognition of what Method and Way Nature makes uſe of in the Conſolidation of fractured Bones, but alſo to the true Reaſon why in ſome Animals, their Bones, if fractur'd, do not re-unite; for in theſe Fractures there will be progenerated a *Porus*, which owes its Cauſe and Origin to the Affluence of the concreſcible or oſſifying Juice, and its Aptitude toward a Concretion, which if it be defective, or not well qualified for this Purpoſe, the *Porus* will want its due Coalition, and, conſequently the fractur'd Bones will not re-unite one to the other, but remain aſunder.

We have given you a brief Account of the Uſes of the concreſcible Juice in the Bones, and their Conſolidation in Caſe of Fractures: Let us now ſee alſo whether this Juice does not alſo oftentimes prove very pernicious to them. 'Tis certain that we feel ſometimes the direful Effects of it; for not only the *Caries* and Putrefactions of the Bones are owing to, or at leaſt promoted by, the vitious Diſpoſition of this Juice, but alſo the *Tophi*, or Nodes of the Gout, and many of the Concretions of the Stone, are progenerated by its Intermixture; for if the *Lympha*, and oleaginous medullary Seroſity, and what other Humours may be diſcharged, or carried otherwiſe by Defluxions, upon the Joints of thoſe that are afflicted with the Gout, if they ſtagnate there, and contract a higher Degree of Acrimony, they are not only apt to paſs gradually through the cartilaginous Incruſtation, but alſo in Proceſs of Time, by their Activity, penetrate into the very Subſtance of the Bones: Here they abrade by little and little the glutinous *Juice*, and are not only impregnated with it, without any conſiderable Detriment of the Bones, but alſo are ſaturated more and more by the Particles of the concreſcible Juice, which is not reaſſum'd by the Blood: But whenever the ſaid ſtagnating Humours cannot be reaſſum'd, or elſe be diſpers'd by Tranſpiration, the more glutinous and viſcid Part remains in the Joints, and is augmented by the reiterated arthritical Defluxions; and being ſaturated with the Particles of the concreſcible Juice, is more and more inſpiſſated, till at laſt it turns into a tophaceous Maſs; and this is the Reaſon why the *Tophi*, or *Nodes*, are never to be ſeen but in the inveterate Gout.

But if it happens, that ſome Part of the beforeſaid glutinous and concreſcible Matter that was detained in the Joints, is reaſſum'd by and circulated along with the Blood till it be ſeparated in the Kidneys, and the ſame is not quickly evacuated by reaſon of its being mix'd with the oſſeous Juice, it will be coagulated into Stones, which will be either more or leſs ſolid, in Proportion as the ſaid oſſeous Juice is intermix'd with a greater or leſſer Quantity of the fluid glutinous Matter; and this is the Reaſon why gouty Perſons are very often afflicted alſo with the Stone. Neither is it hard to conceive how this concreſcible Matter may eaſier and ſooner ſuffer a more ſolid Concretion in the Kedneys than in the Joints; for this concreſcible Matter being intermix'd in the Joints with the *Lympha* and the *oleaginous Seroſity*, it does not ſo eaſily coagulate as in the Kidneys, where it is not only deſtitute of this Seroſity, but on the contrary, the Humours which are carried thither being ſaturated with ſuch ſaline Particles as are of a coagulating Nature, are rather apt to promote than retard ſuch a Concretion.

Neither does this oſſeous Juice produce the Stone only in ſuch as are afflicted with the Gout, but alſo contributes its Share towards the Progeneration of them in others that are not gouty, which ſeems to happen thus.

'Tis certain that a great Number of Twigs of the ſanguineous Ducts are branched out and diſperſed throughout all the Bones, but more eſpecially through thoſe that are not quite ſo hard as the reſt: And it is alſo no leſs certain, that, according to the conſtant Rules of Circulation, the Blood muſt be

convey'd thither, and its circular Motion be continued in them. Now if ſo it happens, that this oſſeous Juice is convey'd thither in too great a Quantity, or that it proves to be more fluid than it ought to be, I ſee no Reaſon why we may not very rationally ſuppoſe, that ſome Part of it at leaſt may repaſs into the Veins, and after this, according to the Law of Circulation, may be convey'd to various Parts of the Body. If among others they are transferr'd to the Kidneys, and ſegregated with the other fluid Excrements, it is eaſie to imagine, that it being of a concreſcible Nature, it may very eaſy degenerate or coagulate into a Stone.

This Concretion may happen alſo in other Parts of the Body after the ſame Manner; for if there be ſuch a Proportion and Diſpoſition in the Secretory Pores of the Veſſels, as to be able to tranſmit or ſecern ſome of the *concreſcible Juice* in ſome Part or other, it may eaſily be transformed there into a ſtony Subſtance, if it happens to meet there with ſome fluid Excrements that have ſuch a Diſpoſition in them; or otherwiſe it may turn into an oſſeous Subſtance, if it meets with a proportionated Structure; ſo that according to this *Hypotheſis*, not only thoſe Concretions that produce the Stone, but alſo thoſe that form the oſſeous Subſtance, which are frequently obſerved in divers Parts of the Body, may be explained in a very rational Method and Order. But notwithſtanding all what has been ſaid upon this Point, I will not pretend to deny, but that the Stone may be produced in the Body alſo by divers other Cauſes; and that moſt eſpecially it may owe its Firſt Origin to certain Aliments which we frequently feed upon; theſe muſt alſo be ſuppoſed to be ſuch as contain much of a glutinous Nature, and argillous or terreſtrial Particles, ſuch as approach very near to that of the before-mention'd oſſeous Juice.

OBSERVATION VII.

Of the Structure of the Os Humeri, *the* Os Cubiti, *and* Radii.

The Bones of the *Humerus*, the *Cubitus*, and *Radius*, ſeem to have very near the ſame Contexture with thoſe of the ſuperior Limbs, according to the Account given of them before.

For on the external Part they are compoſed of various Lamels, united cloſely together by the Means of the *Claviculi*; but on the interior Part their Compoſition is framed by divers Kinds of Lamels, which are diſpoſed in the ſame Order and Variety, and have the ſame Contexture, with that which has been deſcrib'd in the preceding Chapter, in relation to the *Os Femoris*. Neither are the Spongioſities in theſe Bones leſs ſurprizing in their Intertexture than in the before-deſcrib'd Bones; and therefore we judge it not ſuitable to our preſent Purpoſe (which is to be as conciſe as conveniently may be) to trouble the Reader with needleſs Repetitions.

But I cannot forbear to mention, that when I make a Compariſon betwixt theſe Bones, a reaſonable Allowance muſt be given, and a due Conſideration had, of their Magnitude, and what Proportion there is betwixt them; for the *Radius* and the *Fibula* being leſs than the other principal Bones of the Limbs, have therefore not ſo much of the Spongioſity, nor conſiſt of ſo many Lamels; ſo that this Compariſon or Likeneſs muſt not be taken in ſo ſtrict a Senſe, as if all their Spongioſities were formed exactly in the ſame Manner, and out of ſuch Lamels as are altogether like thoſe of the others; but muſt be conſider'd rather as a Contexture made in Imitation of them in the eſſential Parts, eſpecially in what relates to the Diſpoſition of their ſmall Cells and Concamerations; ſo that this Compariſon will bear only in a general Senſe.

And, after all, if we ſhould enter upon a rigorous Examination of all the Differences in the Spongioſities, it would prove a very hard Task, if not quite impoſſible, to meet with very many of them, not only in Bones of different Kinds, but alſo in thoſe of the ſame Sort, which are in all Reſpects exactly like unto one another: But this is not attended with any ill Conſequence, in relation to their Uſefulneſs to their Parts; for let the Frame and Intertexture of the *Laminæ* be diſpoſed in what Manner it will, they never fail to form certain regular Cells and Concamerations, which are the only eſſen-

eſſential Parts that are required to the Formation of theſe Spongioſities.

OBSERVATION VIII.

Relating to the Petrification of Bones.

Some Months ago, on a high Mountain near *Viterbo*, call'd by the Inhabitants *Saxetum*, there were found in a Cavern, or ſome large Cleft, certain Fragments of very large Bones, and ſome *Vertebræ*, being as yet entire, which being put together, were by the vulgar Sort, by reaſon of their exceſſive Magnitude, taken for Giants Bones: But I very much queſtion whether they were humane Bones, they ſeeming to approach, both in reſpect of their Figure and Bulk, rather to the Bones of an Elephant; of which you may be eaſily convinced, if you compare them with the Bones belonging to a Skeleton of the ſame Animal, which is ſet up and preſerved at *Florence*; and therefore I think it more rational to take them for the Bones of ſome large Elephant; at leaſt, till by ſome other peculiar Bones, (which may be found there) ſuch as the *Cranium*, or thoſe of the Fingers, we may found our Judgment upon a more ſure Diſcovery. Beſides that, it ſeems much more probable, that ſuch-like bulky Creatures may have been tranſported into *Italy*, than that this Country ſhould have produced ſuch gigantick Men, which, as far as may be conjectur'd from the ſaid Fragments, muſt have been of about Thirty five Hands in Heighth.

But without inſiſting any further upon this Matter, thus much is moſt certain, as well as peculiarly remarkable in them, that they began to ſhew us ſuch Beginnings of their Petrification, as may lead us to ſome Knowledge of the Origin and Progreſs of the Petrification of the Bones.

Theſe Fragments of the Bones have obtained ſeveral Degrees of Petrification; for in one Part you ſhall ſee but juſt ſomething like a Rudiment of it, but in another Part (though in the ſame Bone) ſomething more perfect; and in a Third a concreted ſtony Subſtance, and that in a greater Quantity; which ſeem to indigitate to us Three different Degrees of Petrification.

In the Firſt Degree there appear certain whitiſh and hard Twigs, which being the Firſt Rudiments of the petrifying Part of the Bone, are diſperſed within the other Subſtance of the Bones, which is friable and calcin'd by Age.

In the Second Degree, the beforeſaid Twigs being produced in Length, ſeem to grow harder, and be divided into many white and ſmall Branches, which extending both in Length and Breadth, are turn'd into white, hard, and lapideous Maſs, which is the laſt Degree, and the ultimate Complement of the Petrification of theſe Bones.

The remaining Subſtance of the Bones, which is not petrified, appears to be of a dark-red Colour, friable, and calcin'd, except in that Part which is next to the ſtony Concretion, which is of an Aſh-colour. On the exterior Part of theſe Fragments there is a tartareous Subſtance, but not all over the Bone, nor in every Place in the ſame Quantity. The beforeſaid Calcination is manifeſt from hence, that theſe Fragments will not flame in the Fire as other Bones do, but will turn red-hot, like the Stones or calcin'd Bones.

Now mark how Nature has proceeded in the Petrification of theſe Bones. Firſt of all, Nature has been intent upon their Calcination, and this ſhe accompliſhes not only by Length of Time, which will reduce even the hardeſt Bones to Aſhes, but alſo by the Help of hot Exhalations: For it ſeems very rational, that ſuch-like hot Vapours may be elevated, eſpecially at certain Seaſons of the Year, into that Cavern where theſe Bones were laid up; and that a Calcination may be performed by the Means of certain Exhalations, is evident from the Philoſophical Calcination or Preparation of the Hartſhorn, which is accompliſhed by the Vapours ſublimated or raiſed from the hot Liquor; and the more or leſs hot the Vapours are, the ſooner or later is this Calcination accompliſh'd; and therefore it being rational to ſuppoſe, that the Vapours in this Cavern were very moderate, this Calcination of the Bones was not performed but by Length of Time.

And conſidering that theſe Fragments do conſiſt as well of a fibrous as a glutinous Subſtance, (like all other Bones) one of theſe Subſtances, during this ſlow Operation, was ſooner calcin'd than the other.

For as ſome certain Part either of the glutinons or of the fibrous Subſtance was ſooner and more perfectly reduced into a *Calx*, the ſooner it was changed into a ſtony Subſtance; for it is eaſy to conceive, that during the Winter Seaſon, abundance of Moiſture, ſaturated with tartareous and ſtony Particles, might drop from the Stones that were over the Cavern into it upon the Bones, and afterwards ſoon penetrate into the Bones, render'd very ſpongious by their Calcination; and conſequently thoſe Particles of the Bones that were moſt calcin'd, and divided into minute Particles, being united with the tartareous Parts, might be coagulated into ſolid Bodies, not unlike ſmall Twigs; as theſe again, in Proceſs of Time, and by their reiterated and freſh *tartareous Imbibitions*, and a continued Calcination, might encreaſe both in their lapideous Solidity and Bulk, (as has been related before) till they did arrive to their full Perfection of a compleat Petrification.

The ſaid oſſeous Fragments are kept, and ſhewn to the Curious, in the *Muſæum* of his Eminency the Cardinal *Chiſius*.

The EXPLANATION of the ſeveral FIGURES relating to this Tract of the *HUMANE BONES*.

Figure I. *repreſents a Skull with its Lamels.*

A. The *Os Frontis*.
B. The *Os Bregmatis*.
C. The *Os Temporum*, and its Plates divided.
E, E, E. The Lamels or oſſeous Scales elevated.
F. The oſſeous *Claviculi*, in the proper Poſition.
G, G, G. The Sutures.

Figure II. *repreſents the* Claviculi *of the external Subſtance of the Bones.*

A. The pointed perpendicular *Claviculi*.
B. The flat-headed perpendicular *Claviculi*.
C. The oblique *Claviculi*.
D. The inflected *Claviculi*, making an Angle.
e, e. The Angles ariſing from the Flexion of the *Claviculi*.

Figure III. *repreſents the external and internal Lamels of the* Os Frontis.

A, B, C, D, E, F. The Lamels of the external Subſtance.
H. The Pit in this Bone.
O, O, O. The corrugated Lamels of the interior Subſtance.
P. The *Meditullium*, or the internal Part of this Bone.

Figure IV. *repreſents the Skull of an abortive* Fœtus, *according to its natural Magnitude.*

A. The central Part of the *Os Bregmatis*, being more perfect than the reſt.
B, B. The Sutures unto which the Filaments are extended. The white Spaces diſperſed betwixt the Filaments ſhew the Increment of the Bone.

Figure V. *ſhews the Origine and Increment of the* Teeth *call'd the* Molares, *or* Grinders.

A, O. The Firſt Rudiments of the *Dentes Molares*.
B. The Progreſs of the external Part.
C. The Square Place where the Root is to break forth.

D. The external Part, ſomewhat more perfect.
E. The Firſt Beginning of the Root.
F. The external Part perfect.
G, G. The Root encreaſed, and divided into Three *Tubuli.*
H, H. The Root compleated.

Figure VI. *repreſents the* Teeth, *cut in the Middle, and calcin'd.*

A, A. The exterior Involucre, with its Filaments.
B. The Root.
C. The external Part, or the Kernel of the Tooth.

B. Figure VII. *A Piece of the external Part of the* Os Femoris; *its Plates or Scales divided.*

C, C. The *Claviculi* belonging to this Part, in their proper Poſition.

A. Figure VIII. *A Part of the* more corrugated *Lamel.*

D, D. The Prominencies or Pleats of the ſame Lamel.

Figure IX. N° 1. *ſhews that theſe ſmall Bones are flat*; N° 2. *ſhews that theſe ſmall Bones are round.*

A, A. The ſmall Bones reſembling to the *Claviculi*, having no Points.
B, B. The ſmall Bones that reſemble unto Twigs cut off.
C, C. The ſhort ſmall Bones.

F. Figure X. *A Part of the* leſs corrugated *Lamel.*

D, D. Its Prominencies or Pleats, or Wrinkles.

E. Figure XI. *A Part of the* leſs perforated *Lamel.*

H. Figure XII. *A Part of the* more perforated *Lamel.*

G. Figure XIII. *A Part of the* reticular *Lamel.*

v, v. The *Foramina* of the ſame Lamel.

Figure XIV. *repreſents the inferior Part of the* Os Femoris, *laid open*; *together with its Lamels, in their proper Situation.*

A, A. The external Subſtance of the *Os Femoris.*
B, B. The Lamels of the external Subſtance.
C, C. The *Claviculi* belonging to this Part, in their proper Poſition.
D. A *more corrugated* Lamel.
E, E, E. The *perforated* Lamels.
F, F, F. The *reticular* Lamels in their proper Poſition.
G, G. A great Number of *Foramina* in the Extremities of this Bone.
H. A miraculous Contexture repreſenting a Coagmentation of Roots.

Figure XV. *and* XVI. *repreſent the beforeſaid miraculous Contexture, fram'd after a different Manner.*

A. Figure XV. *The external Part of the Bone.*

B. The Lamels of the internal Subſtance.
C. The miraculous Contexture, in the Nature of a reticular Involucre.

A. Figure XVI. *The external Subſtance of the Bone.*

B. Repreſents the miraculous Contexture, reſembling to a Coagmentation of Shrubs.

A SKELETON *Decypher'd, or a View of the* Skeleton *of the* HUMANE BODY. *Taken out of Monſieur* Le Clerk's *Exact and Compleat* Oſteology.

1. THE *Os Frontis*, or *Coronale*, does form the ſuperior and anterior Part of the Skull.

2. The *Sutura Coronalis* ſtretches acroſs from one of the *Oſſa Squammoſæ* to the other.

3. The Eyebrows are Two bony Arches, upon which reſt the Muſcles that ſhut the Eyelids. They are placed immediately above the *Orbits*.

4. Their *Head* begins at the great Angle of the Eye, near the Root of the Noſe.

5. But the Tail at the leſſer Angle of the Eye.

6. Upon the ſaid bony Arch that forms the Eyebrow is a Hole, through which paſs the ſanguinous Veſſels. Sometimes there are Two of theſe Holes, and ſometimes only a Chink.

7. The *Foſſa* of the ſuperior *Lacrymal Gland* is ſituated in the Orbit, under the *Tail* of the Eyebrows.

8. The *Apophyſis* of the *Os Frontis*, which forms Part of the leſſer Angle of the Eye. It is articulated with the ſuperior *Apophyſis* of the *Os Mali*.

9. A ſmall ſuperficial *Furrow*, in which is inſerted the Pulley of the larger oblique Muſcle. Its Situation is in the *Os Frontis*, at the ſuperior Part of the great Angle of the Eye.

10. The tranſverſe Suture of the Noſe reaches from one of the great Angles of the Eye to the other.

11. The inferior and lateral Part of the *Os Coronale*, which is conjoin'd with the ſuperior *Apophyſis* of the *Os Cuneiforme*.

12. The *common* Suture of the Skull, and of the Face, begins at the leſſer Angle of the Eye, deſcends into the Bottom of the Orbiter; and reaſcending, paſſes on to the ſuperior Part of the Noſe: Then it deſcends again to the Bottom of the other Orbit, and terminates at the leſſer Angle of the other Eye.

13. The *Oſſa Parietalia* do form the ſuperior, middle, and lateral Part of the Skull.

14. The *Sutura Sagittalis* reaches from the *Sutura Lambdoides* to the *Coronalis*.

15. On the Side of the *Sutura Sagittalis*, a little backwards, are Two ſmall *Foramina*, through which the ſanguineous Veſſels take their Paſſage.

16. The *Apophyſis* upon which reſts the *Os Squammoſum* of the Temples.

17. The *Os Occipitis* forms the poſterior Part of the Head.

18. The Nuke is a large Prominency placed in the Middle of the *Os Occipitis*.

19. Unto the Root of the Nuke is faſten'd on each Side a Muſcle call'd the *Trapezius*, juſt at its lower Part.

20. The Spine of the *Os Occipitis* is a Kind of a Ridge which ſtretches from the great *Foramen*, through which paſſes the Spinal Marrow to the Root of the Nuke. This Spine ſerves to ſeparate Two Furrows on the Right and the Left, deſign'd for the Inſertion of divers Muſcles.

21. The Furrows of the *Complexus* are above the Nuke, and divided by a Ridge.

22. The Furrows of the *Recti Minores* are placed near the great *Foramen*, through which the Spinal Marrow deſcends, and ſeparated by a Ridge.

23. The *Recti Majores* are faſten'd to the Sides of the ſmall Furrows of the *Recti Minores*.

24. The Furrows of the *Muſculi Obliqui Minores*, are ſituated betwixt the great *Foramen* of the Spinal Marrow and the *Apophyſis Maſtoides*. They are very flat.

25. There is a ſmall Prominency at the Edge of the great *Foramen* of the Spinal Marrow, which touches upon another ſmall

Prominency of the First *Vertebra*, to prevent the Head from falling too much backward when it is much extended.

26. Upon the Edge of the great *Foramen* of the Spinal Marrow are placed Two large Prominencies, call'd the *Apophyſes Coronoides*, which are articulated within the Cavities of the First *Vertebra* of the Neck.

27. At the Root of the *Apophyſes Coronoides*, upon the Edge of the great *Foramen* of the *Occiput*, there are certain Pits or ſmall Cavities, into which the large Aponeurotick Ligament that ties the First *Vertebra* to the *Occiput*, has its Inſertion.

28. There is a ſmall Prominency placed commonly at each Side of the *Apophyſes Coronoides*, unto which is faſten'd the Ligament which faſtens the *Apophyſis Dentiformis* of the Second *Vertebra* of the Neck.

29. The Elongation of the *Os Occipitis* reaches from its great *Foramen* to the *Vomer*.

30. To the Protuberancy that is in the Middle of the Elongation of the *Os Occipitis*, is faſten'd on each Side the Muſcle *Subœſophagæus*. Unto the ſame Protuberancy is tied a round Ligament, which prevents the Head from falling too much backwards.

31. That Part which touches upon the Point of the *Apophyſis Dentiformis* of the Second *Vertebra* of the Neck, upon which the Head turns like upon a Pivot, is placed at the anterior Part, upon the Brim of the great *Foramen* of the *Occiput*.

32. The *Sutura Lambdoides* reaches from one of the *Apophyſes Maſtoides* to the other; and at this Suture the occipital Muſcles have their Originations.

33. The *Os Sphænoides*, or *Cuneiforme*, reaches from one Temple to the other, under the Skull.

34. The pointed *Apophyſis* upon which reſts the *Vomer*, is ſituated in the Middle of the *Os Sphænoides*.

35. The *Apophyſes Pterigoides* are placed about the Middle of the *Os Sphænoides*, to wit, one on each Side of the *Vomer*, at the Roots of the laſt Teeth.

36. The interior *Ala* of the *Apophyſis Pterigoides*, is that which is neareſt to the *Vomer*. 37. And the exterior *Ala* of the ſame *Apophyſis*, is that which is moſt remote from the *Vomer*.

38. The *Apophyſis Styliformis*, unto which the *Periſtaphylinus Internus* and the *Sphænopharyngæus* are faſten'd.

39. The *Apophyſis* ſituated below the interior *Ala* of the *Apophyſis Perigoides*, is that round which like a Pulley paſſes the *Periſtaphylinus Internus* and the *Periſtaphylinus Externus*.

40. At the *Baſis* of the *Apophyſis Pterigoides* there is a ſmall Furrow, into which is inſerted the *Periſtaphylinus Internus*.

41. The Two Bones of the Noſe.

42. Two ſmall Holes on the Sides of the *Os Naſi*, through which paſs the *ſanguineous* Veſſels.

43. A ſmall Point at the upper Part of the Bone of the Noſe, towards the great Angle of the Eye, unto which is faſten'd the *Muſculus Attollens Naſi*.

44. Certain Hollowneſſes at the inferior Extremities of the Noſe, unto which is faſten'd the Cartilage call'd the *Acromion*.

45. The *Os Unguis*, ſituated at the great Angle of the Eye.

46. A ſmall Furrow in the *Os Unguis*, in which is incloſed the lacrymal Gland.

47. The *Os Mali*.

48. The ſuperior *Apophyſis* of this Bone, which forms the greateſt Part of the Angle of the Eye, and is articulated with the inferior *Apophyſis* of the *Os Frontis*.

49. A ſmall Hole on each of theſe Bones, through which paſſes a Branch of a Vein. It is ſometimes wanting.

50. The Place where the Cartilages of the Eyelids are faſten'd. It is upon the Brim of the Suture of the leſſer Angle of the Eye, juſt within the Orbit.

51. The poſterior *Apophyſis* of the *Os Mali*, which is articulated with the long *Apophyſis* of the Temple-Bone, to make a Kind of a Bridge for the Muſcle *Crotaphytes*.

52. The anterior *Apophyſis* of the *Os Mali*, which is articulated with the ſuperior Part of the great Bone of the Upper Maxillary.

53. Certain Inequalities at the inferior Part of the *Os Mali*, unto which is faſten'd the *Muſculus Maſſeter*.

54. The ſquamous Part of the *Os Temporum*, which is ſituated at the inferior, middle, and lateral Part of the Skull. The Muſcle

Muſcle *Crotaphytes* is faſten'd to this ſcaly Part.

55. The *Apophyſis Maſtoides* is ſituated at the poſterior Part of the *Os Temporum.*

56. The Muſcle that draws the Ear backwards is faſten'd to the ſuperior and anterior Part of the *Apophyſis Maſtoides.*

57. The *Maſtoideus* is faſten'd to the poſterior Part of the *Apophyſis Maſtoides.*

58. There is a certain hollow Channel at the interior Part of the *Baſis* of the *Apophyſis Maſtoides*, through which paſſes one of the Bellies of the *Digaſtricus.*

59. At the Root of the *Apophyſis Maſtoides*, on its poſterior Part is a ſmall Hole, through which paſſes a large Vein, which carries the Blood into the *Sinus Laterales.*

60. The *Apophyſis Styloides* is near the *Apophyſis Mammillaris*; and,

61. To the End of the ſaid *Apophyſis Styloides* is faſten'd the Ligament of the *Cornua* of the *Os Hyoides.*

62. The *Stylopharingæus* is faſten'd to the interior Part of the *Apophyſis Styloides*; and,

63. The *Styloglosſus* to the anterior Part of the *Styloides.*

64. The *Apophyſis Zygomaticus* makes a Kind of an Arch with the *Apophyſis* of the *Os Mali.*

65. A Pit or Hollowneſs in the Shape of a Creſcent, in the Middle of the inferior Part of the *Apophyſis Zygomaticus*, unto which the *Muſculus Zygomaticus* is faſten'd.

66. An oval Pit betwixt the *Apophyſis Styloides* and *Zygomaticus*, into which is articulated the Head of the Lower Jaw-Bone.

67. The Cavity of the Ear, ſituated betwixt the *Apophyſis Zygomaticus* and *Styloides.*

68. Some Hollowneſſes about the Cavity of the Ear, into which is faſten'd the Cartilage of the Ear.

69. A ſmall Pit behind the Cavity of the Ear, into which is faſten'd the Ligament that ties the Cartilage of the Ear.

70. The Bone of the Upper Mandible, that forms the lower Part of the Face.

71. The ſuperior *Apophyſis* of this Bone of the Upper Mandible, which forms Part of the Arch of the Noſe.

72. A Duct which reaches into the Cavity of the Noſe, in which is placed the lacrymal Gland. The Beginning of this Duct is conſpicuous in the great Angle of the Eye.

73. A Hole under the Orbit, through which paſſes a Branch of the Optick Nerve.

74. A large ſuperficial Furrow under the Orbit, into which is faſten'd the *Muſculus Inciſivus.*

75. The *Muſculus Buccinator* is faſten'd above the Two laſt Teeth of the *Molares.*

76. The pointed *Apophyſis* unto which the carneous Column of the Noſe is faſten'd, is ſituated above the *Dentes Inciſores*, at the Edge of the Cavity of the Noſe.

77. The *Muſculus Dilatans* of the Wings of the Noſe, is above the Root of the *Dens Caninus.*

78. Upon the Edge of the inferior Part of the Orbit, juſt below the lacrymal Hole, there is a ſmall Suture, unto which is faſten'd the ſmall *oblique* Muſcle of the Eye.

79. In the Mouth, betwixt the *Dentes Inciſores*, there is a Hole, through which paſſes a ſmall Artery from the Palate into the Cavity of the Noſe, and a Vein which carries back the Blood.

80. The Two Bones of the Palate are very ſmall and ſquare Bones, placed at the Bottom of the Mouth.

81. On the Sides of the ſmall Bones of the Palate, at the Roots of the laſt *Molares*, are Holes through which the *Nervi Guſtativi* take their Paſſage.

82. A ſmall *Apophyſis* made by the Conjunction of the Two ſmall Bones of the Palate.

83. The *Dentes Inciſores* are placed in the fore Part of the Mouth.

84. The *Dentes Canini*, or Eye-Teeth, on both Sides of the *Inciſores.*

85. The Ten largeſt Teeth of all are call'd the *Molares.*

On the interior Part of the Skull *are obſervable*;

86. Under the Eyebrows in the *Os Frontis* are Two large Caverns or *Sinus's.*

87. The oſſeous *Lamina* that ſeparates theſe Two *Sinus's*, reaches from above down to the Root of the Noſe.

88. The Hole of Communication in the *oſſeous Lamina*, which ſeparates the Two *Sinus's.*

89. The Cells or Anfractuoſities of theſe Two *Sinus's.*

90. There is a Hole in each of theſe *Sinus's*,

nus's, which penetrates into the Cavity of the Noſtrils, for the Tranſmiſſion of the *Lympha.*

91. The oſſeous Circle ſituated at the Bottom of the Cavity of the Ear.

92. The Sinuoſity of the oſſeous Circle, into which paſſes Part of the exterior Muſcle of the Ear.

93. The Edge of the oſſeous Circle, unto which is annexed the Membrane of the *Tympanum.* This Edge runs quite round the interior Side of the Circle.

94. The Barrel of the *Tympanum* is a Cavity ſituated below the oſſeous Circle.

95. The Conduit through which the Air is convey'd to the *Tympanum* reaches into the Mouth.

96. A Conduit which from the Barrel reaches to the Cavity of the *Apophyſis Maſtoides.*

97. A Cavity of the ſuperior Part of the Barrel, in which are placed the Heads of the *Malleus* and the *Incus.*

98. The *Stapes* is known by its Figure.

99. The Foot of the *Stapes* is faſten'd in the *oval Hole.*

100. The Head of the *Stapes*, or Stirrop, on the Side whereof is faſten'd its Muſcle.

101. A ſmall Edge in the *Foramen Ovale*, upon which reſts the Foot of the *Stapes*, the round Hole of the *Barrel*, which gives Entrance to the Air.

102. The *Malleus*, or *Hammer*, is faſten'd to the Membrane of the *Tympanum*, in the Cavity of the Barrel.

103. The *Head* of the *Hammer* is round.

104. The *Handle* of the *Malleus* is faſten'd lengthways to the Membrane of the *Tympanum.*

105. Cavities and Prominencies in the *Head* of the *Malleus*, for the Articulation of its *Head* with the *Incus.*

106. The interior Muſcle of the *Malleus* is faſten'd under the *Head* of the *Malleus.*

107. The *Apophyſis* of the *Malleus*, unto which the Muſcle is faſten'd.

108. The *Incus*, or Anvil, at the Head of which there are Two Cavities and one Prominency, for its Articulation with the Head of the *Malleus.*

109. A ſmall orbicular Bone, placed betwixt the long *Apophyſis* of the *Anvil* and the Head of the *Stirrop.*

110. A Cavity at the Head of the *Incus*, into which is received the Convexity of the ſmall orbicular Bone.

111. The Hole of the *Stapes*, in which there is a Ridge for the faſtening of the Membrane.

112. The *Baſis* or Foot of the *Stapes.*

113. The Fourth ſmall Bone belonging to the Ear, call'd the *Orbicular*, ſituated betwixt the *Head* of the *Stapes* and the long *Apophyſis* of the *Incus*, or *Anvil.*

114. The *Veſtibulum* is a Cavity ſituated behind the *Foramen Ovale.*

115. The Three ſemicircular Conduits; to wit,

116. The *Superior*;

117. The *Inferior*; and,

118. The *Middle* Conduit; are eaſily diſcernable by their Figure.

119. The Five Holes of the Three ſemicircular Conduits, which have a Communication in the *Veſtibulum.*

120. The common Entrance into the *ſuperior* and *inferior* Conduit.

121. The *Cochlea* is diſcernable by its Figure.

122. The Spiral *Lamina* is made like a Pair of Stairs.

123. The *Os Ethmoides*, or *Spongioſum*, is incloſed within the Cavity of the Noſe.

124. The *Os Planum* is ſituated in the Orbit, on the ſame Side where the great Angle of the Eye is.

125. There are certain ſpongious Lamels, which fill up almoſt the whole Cavity of the Noſe.

126. The flat *Lamina* divides the Noſe, in Conjunction with the *Vomer*, in Two Parts.

127. The *Os Spongioſum* is ſeated at the inferior Part of the Cavity of the Noſe.

128. The Cartilage of the Noſe is faſten'd all along to the Furrow of the *Lamina.*

129. A Ridge in the Cavity of the Noſe, made by the Conjunction of the Two large Bones of the Upper Jaw. The *Vomer* reſts all along upon this Spine or Ridge.

130. The *Vomer* is a flat *Lamina*, or Plate, which ſeparates the Noſe into Two Parts.

131. There is a ſmall Pit at the inferior Part of the *Vomer*, which receives a ſmall *Apophyſis*, ſeated in the Middle of the *Os Cuneiforme*, betwixt the Wings call'd *Pterigoides.*

132. The

132. The ſharp-edged Part of the *Vomer* is faſten'd to a long Furrow ſituated above the Arch of the Palate.

133. There is a large *Sinus* or Cavity within the Upper Jaw-Bone, which being lined with Glandules, theſe furniſh a *Lympha*, that diſtils into the Noſe when we lie aſleep upon one Side.

In the Interior Part of the Skull *are to be obſerved:*

134. Two large Cavities in the *Os Coronale*, in which are lodged the Two anterior Lobes of the Brain. Theſe Two Cavities are divided by a ſmall Ridge.

135. Several Protuberancies like Hillocks, unto which the *Dura Mater* is faſten'd.

136. A Furrow like a Gutter, all along which is faſten'd the anterior Part of the *Longitudinal Sinus*. This Gutter begins at the Ridge of the *Criſta Galli*, and aſcends inwardly towards the ſuperior Part of the *Os Coronale*. Sometimes it is only a Spine.

137. At the Root of the *Criſta Galli*, on its fore Part, is a round Hole, unto which is faſten'd the End of the longitudinal *Sinus*.

138. The Ridge, or the *Criſta Galli*, unto which the *Dura Mater* is faſten'd, is ſituated at the inferior Part of the *Os Coronale*, which it divides as it were into Two Parts.

139. The *Os Cribroſum* is an oſſeous *Lamina* of the *Os Ethmoides*, pierced through with many Holes, through which the ſmall Threads of the Nerves of the Firſt Pair, which go to the Noſe, take their Paſſage.

140. There are many ſmall Pits on the ſuperior and interior Part of the Skull, in which the *Dura Mater* is faſten'd. Sometimes they are defective.

141. There are many Holes in the ſuperior and interior Part of the Skull, in which the *Dura Mater* is faſten'd. Sometimes theſe Holes alſo are wanting.

142. Certain long Tracts or Furrows in the *Oſſa Parietaria*, made by the Impreſſion of the ſanguineous Veſſels, which in young People are lodged within theſe Gutters or Furrows.

143. The *Sella Turcica*, in which is lodged the Pituitary Gland. Its Situation is in the Middle of the *Os Sphænoides*.

144. There are ſome ſmall Holes in the *Sella Turcica*, for the Paſſage of the ſanguineous Veſſels; but they are conſpicuous only in young People.

145. There is alſo a *Sinus* or Cavity in the *Sella Turcica*, which is not conſpicuous unleſs you ſaw the *Sphænoides* aſunder.

146. An oſſeous *Lamina* which divides the *Sinus* of the *Os Sphænoides* in Two Cavities.

147. The anterior *Apophyſes Clinoides*, are call'd thoſe Two Points that are placed on the anterior Part, on the Sides of the *Sella Turcica*.

148. The poſterior *Apophyſis Clinoides* of the *Sella Turcica*.

149. Under the anterior *Apophyſes Clinoides* are ſituated the Optick Holes, through which the Optick Nerves paſs. In theſe Holes are faſten'd the *Elevator* of the Eye-lids, the *Major Obliquus*, and ſeveral other Muſcles.

150. A Chink of the *Sphænoides* is ſituated immediately under the anterior *Apophyſis Clinoides*. It is of an Inch in Length, and gives Paſſage to the *Motores Obliqui* of the Eye, *&c.* to the Sixth Pair of Nerves, and to the ſuperior Branch of the Fifth Pair, call'd the *Optick*.

151. There is a very ſmall Hole at the pointed Angle of the great Chink we have mention'd juſt now, through which paſſes a Branch of the internal *Carotides*.

152. There is a ſmall round Hole ſituated about Two Lines below the *great Chink*, and at the Side of the *Sella* of the *Os Sphænoides*, through which paſſes the inferior Twig of the anterior Branch of the Fifth Pair.

153. About Two Lines under the preceding ſmall round Hole is the *Foramen Ovale*, through which the poſterior Branch of the Fifth Pair takes its Paſſage.

154. About a Line's Breadth from this *Foramen Ovale* is a ſmall Hole, through which paſſes a Branch of the external *Carotides*.

155. There are Two large Chinks or Depths in the Side of the *Sella Turcica*, which form the middle Part of the *Baſis* of the Skull, which is the Receptacle of the Brain.

156. At the Point of the *Os Petroſum*, and on the Side of the *Os Sphænoides*, is ſituated a large *Foramen*, which gives Paſſage to

a Branch of the internal *Carotides*, and the *Jugular*.

157. That Part of the *Os Petroſum* which is call'd the Rock makes the internal Ear, which incloſes the Organs of Hearing.

158. There is a Gutter or Furrow ſtretching all along the ſuperior Part of the *Os Petroſum*, into which paſſes a *Sinus* of the *Dura Mater*. This Furrow is ſometimes not conſpicuous.

159. Towards the Middle of the poſterior Part of the *Os Petroſum*, is a *Foramen* that gives Paſſage to the Auditory Nerve.

160. In the Elongation of the *Occiput* there is a large hollow Gutter for the Receptacle of the *Medulla Elongata*, and the vertebral Arteries which enter into the Skull.

161. Under the *Os Petroſum* is a *Foramen*, through which the Spinal Nerve, and that of the Eighth Pair, takes its Egreſs.

162. Juſt by the other Hole, under the *Os Petroſum*, is another *Foramen*, through which the lateral *Sinus's*, which empty themſelves into the internal Jugular, take their Egreſs.

163. There is a long Furrow immediately under the *Os Petroſum*, into which paſſes the Bottom of the Sack (as it is call'd) of the internal Jugular.

164. There is an oval *Foramen* upon the Edge of the great Hole of the *Occiput*, through which paſſes the Nerve of the Ninth Pair. This Hole is ſometimes double.

165. Juſt behind, at the Root of the *Condyli*, there is a Hole, through which paſſes a Veſſel, which opens into the *Sinus Vertebralis*.

166. The great Hole of the *Occiput*, through which the Spinal Marrow does deſcend, is almoſt of the Bigneſs of Three Inches.

167. Two great Cavities or Pits, in which are lodg'd the Lobes of the *Cerebellum*.

168. The *Croſs* of the *Occiput*, unto which the *Dura Mater* is ſtreightly united, runs croſs the whole interior Part of the *Occiput*. To the inferior Branch of the *Croſs* is faſten'd the Duplicature of the *Dura Mater*, which ſeparates the *Cerebellum* into the right and left Part.

169. To the ſuperior Branch of the *Croſs* is faſten'd the inferior Part of the longitudinal *Sinus*.

170. The right Arm of the *Croſs* has a long Furrow, into which paſſes the right longitudinal *Sinus*.

171. The left Arm of the *Croſs* has a Furrow, through which paſſes the left lateral *Sinus*.

172. In the Middle of the *Croſs* is a large Protuberancy. 'Tis in this Place that the longitudinal *Sinus* is divaricated into Two Branches, to the Right and the Left, to form the lateral *Sinus's*. Here is the Beginning of each of the lateral *Sinus's*, and the longitudinal *Sinus*.

173. The inferior *Maxilla*.

174. The *Symphyſis* of the inferior Mandible, being that Part which conjoins the Chin in the Middle from above downwards.

175. The *Apophyſis Condyloides* is that flat Head which is inarticulated with the *Sinus* of the *Os Temporum*. It is incircled by a Ligament, which ties the Mandible to the *Os Temporum*.

176. The *Apophyſis Coracoides* is that flat Point into which is inſerted the Tendon of the *Crotaphytes*.

177. Betwixt the *Apophyſis Condyloides* and *Coronoides* is a *Sinus* formed like a Creſcent, into the interior Part of which is faſten'd the Tendon of the *Pterigoidæus*.

178. The Angle of the inferior Mandible, is call'd that round *Apophyſis* which is ſituated under the Two great *Apophyſes* call'd the *Condyloides* and the *Coronoides*.

179. On the exterior Side of the Angle of the Mandible is a ſuperficial Cavity, in which one of the Tendons of the *Maſſeter* is faſten'd.

180. At the Middle and inferior Part of the Mandible the Second Tendon of the *Maſſeter* is faſten'd.

181. To the inferior and exterior Part of the *Baſis* of the Mandible, towards the Chin is faſten'd the triangular Muſcle.

182. There is a Hole or Entrance into a Canal or Cavity, which runs quite round the Mandible, into which paſſes a Branch of the internal Jugular, a Branch of the external Carotide Artery, a Branch of the Nerve of the internal Maxillary, and Three Branches of the Fifth Pair of Nerves. This Hole is ſituated under the great Creſcent formed by the Two *Apophyſes* inwardly.

183.

183. On each Side of the Chin is placed an oval Hole, through which the Veſſels that enter into the Mandible have their Egreſs.

184. Juſt at the inferior and interior Part of the Chin are faſten'd the *Digaſtrici.*

185. Immediately above the preceding is faſten'd the *Genihyoidæus*: And,

186. Immediately above this laſt is faſten'd the *Genioglosſus.*

187. On the interior Part of the Roots of the great Teeth the *Mylohyoidæus* is faſten'd.

188. Above the Angle of the Mandible, on the interior Part, is a ſuperficial *Sinus*, into which is faſten'd the *Muſculus Pterigoidæus Internus.*

189. On each Side of the *Symphyſis* of the Chin is a Pit, in which is faſten'd the *Muſculus Quadratus.*

190. The *Os Hyoides*, which is placed at the Bottom of the Mouth, and is of the Figure of a Fork, ſerves for a Support to the Tongue.

191. Unto the *Baſis* of the *Os Hyoides* are faſten'd the *Sternohyoidæus*, the *Coracoides*, the *Styloceratohyoidæus*, the *Geniohyoidæus*, the *Milohyoidæus*, and the Tongue. This *Baſis* is the biggeſt Part of the Bone.

192. To the *Cornua* or Horns of the *Hyoides* is faſten'd a round Ligament, which with its other Extremity is tied to the ſuperior *Horn* of the Cartilage *Thyroides.*

193. There is a large Cavity at the *Baſis* of the *Hyoides*, into which is faſten'd a Ligament that faſtens the Cartilage *Hyoides.*

194. The *Larynx* conſiſts of Five Cartilages, to wit;

195. The *Scutiformis*, which is concave within, and convex on the Outſide: At the inferior Part of which are faſten'd the *Bronchiæus* and the *Hyothyroidæus.*

196. The *Cricoides*, or the Annular. The interior *Cricoidæus* has its Origination at the interior Part of this Cartilage; as the *Cricothyroidæus Poſterior* has his at its poſterior and ſuperior Part. The *Cricothyroideus Lateralis* riſes at the interior Side of this Muſcle.

197. The *Arytænoidæus* is placed in the Cavity of the *Scutiformis.* It is form'd of Two Cartilages, which both together make that Chink call'd the *Glottis.* The *Arytænoidæus* is faſten'd to that Part where the *Cartilago Annularis* is united with the *Arytænoides.*

198. The *Epiglottis* covers the Opening of the *Larynx.*

199. The Firſt *Vertebra* of the Neck, or the *Atlas.*

200. In the Middle of the Firſt *Vertebra* of the Neck is a Prominency, unto which are faſten'd the *Muſculi Recti Minores.*

201. At the Side of the great Hole of the Spinal Marrow are Two large Cavities, into which the Two *Apophyſes* of the *Occiput* are articulated.

202. The oblique aſcending *Apophyſis* is call'd that round Prominency which is ſeated at the Side of each of the large Cavities.

203. The oblique deſcending *Apophyſes* are immediately under the aſcending.

204. On the Side of each of the aſcending *Apophyſes* is a ſmall Furrow, through which paſſes the vertebral Artery, and the Tenth Pair of Nerves.

205. A ſuperficial Cavity, into which is received the Side of the Dentiform *Apophyſis* of the Second *Vertebra.* This Cavity is in the interior and anterior Part of the Circle of the *Vertebra.*

206. The tranſverſe *Apophyſes* run horizontal on each Side of the *Vertebra.*

207. At the End of the tranſverſe *Apophyſis* of the Firſt *Vertebra* are faſten'd the *Muſculi Obliqui Majores & Minores.*

208. A ſmall Prominency, unto which is faſten'd the Ligament which keeps the *Apophyſis Dentiformis* ſteddy. This Prominency is placed on each interior Side of the *Vertebra.*

209. In the Middle of the *Vertebra* forward is ſituated a ſmall Prominency, into which is faſten'd the Tendon of the *Muſculus Longus.*

210. The *Foramen* through which paſſes the Vertebral Artery. Sometimes it is only a large Cleft, which is on each Side of the *deſcending Apophyſes*, under the oſſeous Circle of the Firſt *Vertebra.*

211. The *Apophyſis Dentiformis* of the Second *Vertebra* is ſeated in the Middle of the Body of the *Vertebra* forward.

212. A ſmall Prominency on each Side of the *Apophyſis Dentiformis*, unto which is faſten'd

ſten'd a ſmall round Ligament, to keep ſteady the Dentiform Proceſs.

213. A ſmall Protuberancy at the Middle of the *Apophyſis Dentiformis*, which is articulated with the interior Part of the Firſt *Vertebra*.

214. There is a ſuperficial Cavity on each Side of the Spinous *Apophyſis* of the Second *Vertebra*, into which is faſten'd the *Muſculus Obliquus Major*.

215. There is a Channel or Furrow on each Side of the Seven *Vertebræ* of the Neck, in which do paſs the cervical Arteries. This Channel is form'd by the Holes that are in each of the tranſverſe *Apophyſes*.

216. There is a Furrow or Gutter under each of the Spinous *Apophyſes* of the Six Firſt *Vertebræ* of the Neck. This Gutter receives the Back of the inferior *Vertebra*.

217. On each Side of the Bodies of the Six inferior *Vertebræ* of the Neck, on the interior Part, is placed the *Muſculus Longus*.

218. There is a Cavity on each Side of the Body of the *Vertebræ* of the Back, which receives the Head of a Rib.

219. There is a Cavity on each tranſverſe *Apophyſis*, which receives a Prominency of a Rib.

220. The Spinous *Apophyſes* of the *Os Sacrum*, unto which is faſten'd the *Glutæus Major*. They are in the Middle, and go from above downward on the poſterior Part.

221. The great *Foramen* which runs all along the *Os Sacrum* from above downward, through which paſs Six large Branches of Nerves.

222. Eight great Holes on the poſterior Part, through which Eight large Branches of the Nerves have their Egreſs.

223. The great *Foramen* at the Extremity of the *Os Sacrum*, through which a large Pair of Nerves have their Egreſs.

224. Eight great interior Holes of the *Os Sacrum*, cover'd with Membranes.

225. The oblique *Apophyſes* of the *Os Sacrum*. They are ſeated on the poſterior Part, all along on each Side of the Bone.

226. The concave Part of the *Os Sacrum* ſuſtains the *Inteſtinum Rectum*, the *Matrix*, and the Bladder.

227. The *Os Coccigis* is a Kind of a Tail, tied to the Extremity of the *Os Sacrum*. It ſupports the *Inteſtinum Rectum*, and gives Originations to the *Sphincter*, and ſome other Muſcles.

228. There is a ſmall *Sinus* ſituated at the ſuperior Part of the *Os Coccigis*, into which the laſt *Vertebra* of the *Os Sacrum* is received.

229. The Head on the poſterior Part of the Rib, which enters into a Cavity of the Body of the *Vertebra*.

230. A ſmall Protuberancy at a Finger's Diſtance from the poſterior Extremity of the Rib, which enters into a Cavity of the tranſverſe *Apophyſis* of the *Vertebra*.

231. A long Furrow in the interior Part of the Rib, through which the Intercoſtal Artery, Vein, and Nerve, take their Paſſage.

232. Near the Ribs, at an Inch's Diſtance backwards, is faſten'd the Ligament which ties the Rib with the *Vertebra*.

233. The *Sternum* forms the anterior and middle Part of the *Thorax*, or Cheſt.

234. The Firſt Bone of the *Sternum* makes the ſuperior Part of it.

235. That Gutter or Furrow through which paſſes the *Trachæa Arteria* is ſituated at the ſuperior and interior Part of the *Sternum*, and is call'd the *Jugulum*.

236. On each Side of the beforeſaid Furrow, and on the ſuperior Part of the *Sternum*, is a *Sinus*, which receives the Extremity of the *Clavicula*.

237. The Hollowneſſes all along on each Side of the *Sternum*, which receives the Ends of the Ribs.

238. The Cartilage *Xiphoides* is the Point that is plac'd at the undermoſt Part of the *Sternum*.

239. All along the middle and inner Part of the *Sternum*, the *Mediaſtinum* is faſten'd to it.

240. There is a Prutuberancy on each Side of the *Jugulum*, unto which the *Sternohyoidæus* is faſten'd.

241. On each Side of the Cartilage *Xiphoides* are faſten'd the Two *Muſculi Recti*.

242. The *Clavicula* is ſituated immediately above the Ribs.

243. Superficial Cavities at the round Ends of the *Clavicula*, into which the *Sternum* is articulated.

244. The round and convex Part of the *Clavicula*.

245. The

245. The flat Extremity of the *Clavicula*, which is articulated with the *Acromion*.

246. The Two large Bones ſituated at the ſuperior Part of the Back are call'd the *Omoplatæ*.

247. the long tranſverſe *Apophyſis* is call'd the *Spine* of the *Omoplata*.

248. In the Cavity that is above the Spine of the *Omoplata*, the *Muſculus Supraſpinatus* has its Inſertion.

249. In the Cavity that is below the Spine of the *Omoplata*, is placed the *Muſculus Infraſpinatus*.

250. The Brim of the ſuperior Part of the *Omoplata*, is call'd the ſuperior Side of the *Omoplata*.

251. All that Side of the *Omoplata* which looks forward, is call'd the inferior Side of the *Omoplata*.

252. All that Side which looks towards the Spine of the Back, is call'd the *Baſis* of the *Omoplata*.

253. The inferior Point is call'd the inferior Angle of the *Omoplata*.

254. The Extremity of the Spine of the *Omoplata* is call'd the *Acromion*. The *Deltoides* is faſten'd to it.

255. Upon the Brim of the Cavity into which the Arm is articulated, is a long *Apophyſis*, call'd the *Apophyſis Coracoides*. To its Extremity are faſten'd the *Pectoralis Minor*, the *Biceps*, and the *Coracoides*.

256. The ſuperficial Cavity of the *Omoplata*, into which the Head of the *Humerus* is articulated.

257. On the exterior Part of the Extremity of the *Acromion* there is a ſmall ſuperficial Cavity, which receives the End of the *Clavicula*.

258. All about the Edge of the Cavity of the *Omoplata*, which receives the *Os Humeri*, is faſten'd a cartilaginous Ligament, which adds to the Depth of the Cavity.

259. All along the inferior Side, at the exterior Brim of the *Omoplata*, is a long Furrow, in which lies the *Muſculus Parvus Rotundus*.

260. In that large Cavity which comprehends all the interior Part of the *Omoplata*, is placed the *Muſculus Subſcapularis*.

261. The *Humerus*.

262. The round Part which is at its Extremity is call'd the Head of the *Humerus*.

263. A long Furrow or Hollowneſs, which begins upon the Head of the *Humerus*, in which is plac'd one of the Tendons of the *Biceps*.

264. At the inferior, internal, and lateral Part of the *Humerus*, there is an *Apophyſis* of an Inch long, which runs into a Point call'd the interior *Condylus*. At this *Apophyſis* all the Flexors of the *Carpus*, the *Pronator Rotundus*, and the Flexor of the Fingers call'd the *Sublimis*, and the *Palmaris*, have their Originations.

265. At the exterior *Condylus* the Extenſors of the *Carpus*, and the *Brevis Supinator*, and Extenſor of the Fingers, take their Origin. This *Condylus* is plac'd at the exterior and lateral Part of the *Humerus*.

266. There is a large Cavity on the inferior and poſterior Part of the *Os Humeri*, into which the *Olecranum* is fix'd.

267. At the inferior and anterior Part of the *Os Humeri* is a ſmall *Sinus*, into which is articulated the ſuperior *Apophyſis* of the *Cubitus* when the Arm is bent.

268. On the exterior Part of the *Os Humeri* there is a Ridge or Spine, unto which is faſten'd the *Brachiæus Externus*.

269. At the lowermoſt Extremity of the *Os Humeri* there are Two *Sinus's*, divided by a Ridge or Spine, which is received into a *Sinus* of the *Os Cubiti*.

270. The interior *Sinus*, which receives an *Apophyſis* of the *Os Humeri*.

271. The exterior *Sinus*, which receives the Edge of the Cavity of the *Radius*.

272. The *Os Cubiti*.

273. The *Olecranum* is that large *Apophyſis* which terminates in a Beak, which is ſituated upon the ſuperior and poſterior Part of the *Os Cubiti*. Into this *Apophyſis* the Tendon of the *Extenſor Longus* and *Brevis* of the Arm, and the Tendon of the *Brachiæus Externus*, are faſten'd.

274. There is a large Cavity at the ſuperior Part of the *Os Cubiti*, in which rowls the *Os Humeri*.

275. A *Sinus* like a Creſcent, in which the *Radius* turns, for the Pronation and Supination. This *Sinus* is at the ſuperior, external, lateral Part of the *Os Cubiti*.

276. At the ſuperior and anterior Part of the *Os Cubiti* is a ſhort pointed *Apophyſis*, which is articulated with a *Sinus* of the in-

ferior and anterior Part of the *Humerus*.

277. A Prominency like a Spine immediately under the *Sinus* of the *Os Cubiti*, in which turns the Brim of the *Radius*. Unto this Prominency is fasten'd the Tendon of the *Brachiæus*.

278. A long sharp-edged *Apophysis* stretching all along the *Cubitus* towards the *Radius*, all along unto which is fasten'd a large Ligament, which ties the *Cubitus* to the *Radius*.

279. The *Apophysis Styloides* is a Point at the lowermost Extremity of the *Os Cubiti*, which prevents the *Carpus* from slipping inwards.

280. The *Radius* is that Bone which, together with the *Cubitus*, forms the fore Arm.

281. The Cavity which is just at the superior Extremity of the *Radius*, is that which receives an *Apophysis* of the *Humerus*.

282. There is a Prominency about an Inch below the superior Head of the *Radius*, which receives the Tendon of the *Biceps*.

283. Unto the long sharp-edged *Apophysis* which stretches almost all along the *Radius*, there is fasten'd a large Ligament, which ties this Bone together with the *Cubitus*.

284. The Two Cavities that are at the lowermost Extremity of the *Radius*, receive the Two Bones of the *Carpus*.

285. The Cavity that is like a Crescent on the inferior Part of the *Radius*, receives the Side of the inferior Head of the *Os Cubiti*.

286. The *Apophysis Slyloides* prevents the slipping of the Wrist outwards. This *Apophysis* is situated on the Outside of the lowermost Part of the *Radius*.

287. The Annular Ligament is fasten'd upon the Bone that is without the Rank.

288. The Bone that sustains the Thumb has a long pointed *Apophysis*, unto which the Annular Ligament is fasten'd at one End, as also the *Flexor Carpi*.

289. The Annular Ligament is fasten'd also to the *Apophysis* of the First Bone of the Second Rank of the Fingers.

290. The *Antitenar* of the Thumb is fasten'd to the *Os Metacarpi*, which sustains the *Index* on the interior Part.

291. The *Hypotenar* of the Little Finger is fasten'd to the exterior Part of the *Os Carpi*, which is without the Rank.

292. There is a Point or Prominency at the inferior Part of the *Os Metacarpi*, which supports the Little Finger, and has the *Musculus Cubitæus Externus* fasten'd to it.

293. All along the *Phalanxes*, or Ranks of the Fingers, on the Inside, are certain Gutters or Furrows, into which the Tendons of the Flexors of the Fingers are inserted.

294. All along the Sides of the Fingers are also certain Ridges, unto which are fasten'd the Ligaments of the Tendons of the Flexors of the Fingers.

295. At the inferior Extremity of each of the *Phalanxes* of the First Row is a Cavity, into which is articulated the Head of each Bone of the *Metacarpus*.

296. The Two large Bones that are conjoin'd with the *Os Sacrum*, are call'd the *Ossa Innominata*.

297. The *Sinus's* and *Apophyses* at the posterior Part of the *Os Ilium*, which are inarticulated at the Sides of the *Os Sacrum*.

298. There is a great Cavity on the exterior Part, in which Three Muscles are lodg'd.

299. There is a Chink at the inferior and anterior Part of the *Os Ilium*, through which passes the Tendon of the *Obturatores*.

300. There is a pointed Prominency on the anterior Part of the *Os Ilium*, which is call'd its superior and anterior Spine.

301. The interior *Lip* of the *Os Ilium* is the interior Brim of the superior Circumference of the *Os Ilium*.

302. The external *Lip* of the *Os Ilium* is the exterior Edge of the superior Circumference of the *Os Ilium*.

303. The anterior and inferior Spine of the *Os Ilium*, is the *Apophysis* which is betwixt the superior Spine and the great Cavity.

304. The *Os Ischium* does form the inferior and posterior Part of the *Os Innominatum*.

305. The Protuberancy of the *Ischium*, is that large *Apophysis* upon which we do sit.

306. The Spine of the *Ischium*, is call'd the Point that is under the *Ischium*, behind the Cavity, and which looks towards the *Os Sacrum*. One of the *Quadrigemini* is fasten'd to it.

307. There

307. There is a large Furrow betwixt the Spine of the *Ischium* and its Protuberancy, through which passes the *Obturator Internus*.

308. There is a large oval *Foramen* under the Cavity, about which are fasten'd the *Obturatores*.

309. The *Os Pubis* forms the anterior Part of the *Os Innominatum*.

310. On the superior Part of the *Foramen Ovale*, under the Cavity, is a Furrow, through which the Iliack Veins and Arteries have their Passage.

311. On the *Os Pubis*, betwixt the Cavity and the Protuberancy, there is a large Furrow in the Shape of a Crescent, through which pass the Iliack Veins and Arteries, and the Spermatick Vessels.

312. Within that Space or Interstice which makes an Angle betwixt the Two *Ossa Pubis*, is plac'd and fasten'd the Yard and the *Clitoris*.

313. The superior and anterior Part of the *Os Pubis*, for about an Inch on each Side, is call'd the Spine. The *Musculi Recti* of the *Abdomen* are fasten'd to this Spine.

314. The *Femur*, or the Thigh-Bone.

315. On its superior Part is the Head of the *Femur*.

316. Unto the *Sinus* which is at the Extremity of the *Femur* is fasten'd a round Ligament, which ties the Head of this Bone within the Cavity of the *Os Ischium*.

317. A Kind of a Circle made by the Inequalities which are all round the inferior Part of the Head of the *Femur*, unto which is fasten'd a Kind of a Prominency, which is united again to the exterior Edge of the Cavity, and contains a Sort of an unctuous Substance, which renders the Joint supple.

318. The slender Part of the Bone, which is under the Head, and upon which it rests, is call'd the Neck of the *Femur*.

319. The great *Trochanter* is call'd a large *Apophysis* which is at the Side of the Head of the *Femur*, unto which several Muscles are fasten'd.

320. There is a *Sinus* at the Root of the great *Trochanter*, into which the *Musculi Quadrigemini* and *Obturatores* are fasten'd.

321. The lesser *Trochanter* is an *Apophysis* at the Root of the great *Trochanter*. The Flexor of the *Femur* and the *Iliacus* is fasten'd to it.

322. There is a small *Apophysis* at the Root of the lesser *Trochanter*, to the posterior Part of which is fasten'd the Tendon of the *Glutæus Major*.

323. That sharp Ridge which runs all along the posterior Part of the *Femur*, has several Muscles fasten'd to it.

324. The interior *Condylus* of the Thigh-Bone, is a large *Apophysis* on the interior Part of the lowermost Extremity of the Thigh.

325. The exterior *Condylus* of the Thigh-Bone, is that large *Apophysis* which is plac'd at the exterior Part of the lowermost Extremity of the Thigh-Bone.

326. The great Cavity betwixt the Two *Condyli*, which receives a Prominency of the *Tibia*.

327. On each interior Part of the *Condyli* there is a Cavity, which receives a nervous Ligament.

328. A *Sinus* on the Side of the exterior *Condylus*, in which is fasten'd a large Ligament, which is tied also to the *Perone*.

329. A Cavity betwixt the Two *Condyli*, which are on the lower Part of the *Femur*, that receives the *Rotula*.

330. The *Rotula* is a round Bone, situated at the inferior Part of the *Femur*.

331. A Prominency which stretches from above downwards under the *Rotula*. This Prominency enters into a Cavity which is at the inferior and anterior Part of the *Femur*.

332. A pointed Prominency on the inferior Part of the *Rotula*, upon which is fasten'd a large Ligament, which is fasten'd also to the *Femur* with its other Extremity.

333. The *Tibia* is call'd the great Bone of the Leg.

334. The *Epiphysis* of the *Tibia* is call'd that large Head which is situated at its superior Part.

335. There is an *Apophysis* on the Middle of the *Epiphysis* of the *Tibia*, which is received into the Interstice of the Two Prominencies of the *Femur*.

336. There are Two Cavities at the superior Part of the *Tibia*, to wit, one on each Side of an *Apophysis*, that is situated upon the Middle of this Bone. These Two Cavities receive the Two Prominencies of the *Femur*.

337. Unto

337. Unto the Root of the *Apophyſis*, which is at the anterior Part of the ſuperior Extremity of the *Tibia*, there are faſten'd on each Side Two nervous Ligaments, which with their other Extremities are faſten'd to the inferior Part of the *Femur*.

338. There is a ſmall round Head, incruſtated with a Cartilage, ſeated on the exterior Side of the Ridge of the *Femur* backwards, which enters into the lateral, ſuperior, and internal Part of the *Perone*.

339. There is a Protuberancy on the anterior and ſuperior Part of the *Tibia*, about Two Inches below the *Epiphyſis*, unto which are faſten'd the *Extenſores* of the Leg.

340. The external Ridge of the *Tibia*, unto which is faſten'd a large Ligament, which ties the *Tibia* and the *Perone* together. It is pretty ſharp-edged, and runs all along the external lateral Side of the *Tibia*.

341. A ſuperficial Furrow on the interior Side of the ſuperior *Epiphyſis* of the *Tibia*, in which is faſten'd a large Ligament, which at its other Extremity is tied to the Side of the interior *Apophyſis* of the *Femur*.

342. At the ſuperior and poſterior Part of the *Tibia* and *Perone*, in that Part where theſe Two Bones touch together, the *Extenſor* of the Foot, the *Flexors* of the Toes, and the *Muſculus Longus*, have their Originations.

343. A ſuperficial *Sinus* on the exterior Side of the ſuperior *Epiphyſis* of the *Tibia*, in which is faſten'd a large Ligament, that is tied with its other End to the exterior Side of the *Femur*.

344. The Spine or Firſt Line of the *Tibia*, is that edged Part of the Bone which runs all along its anterior Part.

345. The interior Ridge or Edge, is that obtuſe Line which runs all along its interior Part.

346. The flat interior Part is on the inner Side of this Bone.

347. The flat exterior Part of this Bone is on the exterior Side. Upon this are plac'd many Muſcles.

348. The flat poſterior Part of the *Tibia* is on its Backſide; and ſeveral Muſcles are plac'd on it.

349. The long *Apophyſis* that is ſituated at the lowermoſt Part of the *Tibia*, does form the *Malleolus Internus*, and prevents the Dislocation of the Foot on that Side. The Annular Ligament is faſten'd alſo to this *Appendix*.

350. There is a Cavity juſt at the End of the *Malleolus Internus* of the *Tibia*, through which the Tendon of the *Peroneus Anticus* does paſs.

351. In the great Furrow which is on the anterior and lowermoſt Part of the *Tibia*, the *Perone* is articulated on the Side.

352. There is a large Cavity at the very lower End of the *Tibia*, in which the *Aſtralagus* is inarticulated.

353. The *Perone* is the leſſer Bone of the Leg.

354. The ſmall *Sinus* that is ſituated at the ſuperior and internal Part of the *Perone*, receives a ſmall *Apophyſis* that is placed at the ſuperior Part of the *Tibia*.

355. The Tendon of the *Biceps* is faſten'd to the ſuperior and poſterior Part of the *Perone*.

356. The *Faſcialata* and the *Peronæus Proſticus* are faſten'd to the ſuperior and exterior Part of the *Perone*.

357. The *Flexor* of the Great Toe, is faſten'd to that upper Part of the *Perone* where it is conjoin'd with the *Tibia*.

358. The edged Ridge which runs along the interior Part of the *Perone*, unto which is faſten'd a membranous Ligament which from thence extends to the *Tibia*.

359. From the pointed Head at the inferior Part of the *Perone*, which makes the external Part of the Foot, ariſes the Annular Ligament.

360. The flat, interior, lateral, and inferior Part of the *Perone*, is conjoin'd with the Side of the *Aſtralagus*.

361. Through the Chink or Cleft at the End of the inferior Head of the *Perone*, which makes the exterior Part of the Foot, paſſes the Tendon of the *Flexor* of the Foot.

362. The *Aſtralagus* is a large Bone of the *Tarſus*, and the higheſt of the Foot, which is articulated with the *Tibia*.

363. The long *Apophyſis* that is ſituated at the anterior Part of the *Aſtralagus*, enters into the Cavity of the *Os Naviculare*.

364. There is a large Cavity under the *Aſtralagus*, which receives the ſuperior Part of the *Calcaneum*.

365.

365. The interior Side of the *Aſtralagus* receives the *Malleolus Internus.*

366. The exterior Side of the *Aſtralagus* receives the *Malleolus Externus.*

367. On the interior Side of the *Aſtralagus* is a ſmall rugged *Sinus*, into which is faſten'd a Ligament, which ties the Bones of the Leg to the *Talus.*

368. Upon the Elongation of the Bone of the *Aſtralagus* there is a Cavity, into which enters a large Prominency, which is ſituated at the inferior Part of the *Tibia.*

369. A Channel or Furrow on the hinder Part of the *Aſtralagus*, which reaches to its interior Side, through which paſs the Tendons of the Muſcles of the Foot.

370. A Channel on the poſterior Part of the *Aſtralagus*, which ſtretches to the exterior Side, into which paſſes a Ligament, which ties the Bones of the Leg with the *Talus.*

371. The *Sinus* that is under the *Aſtralagus*, and reaches from one Side to the other, is full of a gelatinous Subſtance, that moiſtens the Ligaments of the Foot.

372. The *Calcaneum* is the largeſt Bone of the *Tarſus.*

373. The great Cavity of the *Calcaneum* receives the inferior Part of the *Aſtralagus.*

374. The Cavity which is at the End of the *Calcaneum*, on its anterior Part, receives the *Os Cuboides.*

375. On the interior Side of the *Calcaneum* is a Furrow, through which paſſes the Tendon which moves the Foot obliquely, the Tendons of the Flexors of the Foot, a Vein, a Nerve, and an Artery.

376. The flat Part of the poſterior Extremity of the *Calcaneum*, into which is faſten'd the Tendon of *Achilles*, that of the *Plantaris*, and *Solæus.*

377. The *Os Naviculare* is plac'd betwixt the *Aſtralagus* and the Three *Oſſa Cuneiformia.*

378. The great Cavity on the poſterior Part of the *Aſtralagus.*

379. Three very ſuperficial Cavities upon the anterior Part of the *Os Naviculare*, which receive the Three *Oſſa Cuneiformia.*

380. The *Os Cuboides* is ſituated betwixt the *Calcaneum*, the Little Toe, and its next adjacent.

381. The poſterior Part of the *Cuboides* is received into the anterior *Sinus* of the Elongation of the *Calcaneum.*

382. Two very ſuperficial Cavities on the anterior Extremity of the *Cuboides*, which receive Two Bones of the *Metatarſus.*

383. The internal lateral Part of the *Cuboides*, which receives one of the *Oſſa Cuneiformia.*

384. A long Furrow in the interior Part of the *Cuboides*, through which paſſes a Tendon.

385. The Three *Oſſa Cuneiformia* are ſituated betwixt the *Os Naviculare*, the *Cuboides*, and Three Bones of the *Metatarſus.*

386. A ſmall Prominency under the *Cuneiforme Medium*, into which the poſterior *Muſculus Tibialis* has its Inſertion.

387. The Five Bones of the *Metatarſus* are ſituated betwixt thoſe of the *Tarſus* and of the Toes.

388. A pointed *Apophyſis* under the Bone of the *Metatarſus*, which ſuſtains the Great Toe on the poſterior Part.

389. A long pointed *Apophyſis* at the poſterior Part of the Bone of the *Metatarſus*, which ſuſtains the Great Toe. Unto this *Apophyſis* the Tendon of the *Peronæus* is faſten'd.

390. Two Cavities under the *Os Metatarſi*, which ſuſtains the Great Toe, and the anterior Part. In theſe Cavities are plac'd Two of the *Oſſa Seſamoidea.*

391. Small articular Prominencies at the Extremities of each Bone, that form the Extremities of the Toes. Unto this ſmall Circle is faſten'd each Angle of the Toes.

Dr. SIMON PAULI, *his True Method of Dealbation, or Whitening the* Bones, *for the Compoſition of a* Skeleton. *Taken from the* Acta Eruditorum, *publiſhed at* Copenhagen.

I Would have all thoſe that apply themſelves to the Study of Anatomy and Chirurgery, not to be ignorant, that there is a certain Way of whitening and beautifying of Bones, ſo that they appear not much inferior in their Luſtre to Ivory it ſelf. However, this is a Work of Time and Patience: And you muſt take Care, after you have artificially and nicely boil'd your Bones, to expoſe them Day and Night, both in Rain and Sun-ſhine, to the free Air and the Sun-Beams, and that in ſome high or eminent Place near the Top of the Houſe, which faces the *Eaſt* and *South* Sun. This is moſt conveniently to be done, or at leaſt begun, after the Hybernal Solſtice, towards the latter End of *December*, (which ought to be peculiarly taken Notice of) the Months of *January*, *February*, *March*, *April*, and *May* alſo, being more proper for this Operation than any other Months or Seaſons of the whole Year. Thoſe that are deſirous to know the true Reaſons thereof, may be ſatisfied therein by my Commentary concerning the *Malignant Fevers*, and out of my Account of the *Leuticula Paluſtris*.

I will only add thus much at this Time, That there is a certain Way of exalting (as the Chymiſts call it) the Salt which is contained in the Snow and Rain during the Winter and Spring Seaſons for our preſent Purpoſe. To effect this, you muſt take ſome large Fragments, of about a Cubit in Length, of the beſt Slates you can get, and dip theſe Bones, or rather macerate them, for many Days, or for ſeveral Weeks together. Theſe Fragments of the Slates, whilſt they are very wet, and without being dried, you muſt put under the Bones that are to be expoſed to the Air, and that upon a broad Table made of Deal Board or Planks, but not of Oak; the Edges whereof muſt be raiſed above the Surface about the Heighth of a Palm and an Inch thick, but not perpendicular, or ſo as to make an acute, but an obtuſe Angle with the Surface of the Table or Board; which muſt be done to this End, that there may be nothing in the Way, ſo as to intercept the Sun-Beams, from the Time of its Riſing to Sun-Set, by caſting a Shadow upon the Table. This Table, which muſt be ſhaped in Imitation of a Waterman's ſmall Boat or Wherry, (ſuch as they carry and bring their Sand into *Copenhagen* for Sale) you muſt firſt of all cover all over, to the Heighth of Two Inches thick, with the fineſt Sand, ſuch as you meet with near the Sea-Shore, and then put your Fragments of the Slates, ſuch as have been deſcribed before, upon this Sand, ſo as to leave ſome Spaces betwixt them; and laſt of all, the Bones intended to be whiten'd upon theſe Slates; which done, you muſt expoſe them as beforeſaid to the Sun and Air.

The mere Intention and Uſe of the Sand is, to put and as it were to bury in it the Bones of the *Carpus*, the *Metacarpus*, of the *Tarſus*, and the *Metatarſus*, which contains much of a medullary Oil; and this oleaginous Subſtance being extracted by the Sun-Beams, beyond what could be done by their Coction, is imbib'd by the ſand, like as brown Paper will take up Ink.

But to return to the Uſe of the Snow and Rain-Water, as far as it relates to our preſent Purpoſe, you muſt obſerve, that when it does not rain, you muſt take Care to ſprinkle moſt frequently in the Day-time both the Bones and the Slates that lie under them, by the Means of hard Hair-Bruſhes, (ſuch as we uſe for our Clothes) dipp'd in Snow or Rain-Water: Nay, it is alſo very expe-

dient

dient to rub the Bones with them; but this muſt not be done till about Noon, when the Sun has quite dried up the Dew of the preceding Night. In this Manner you may and muſt ſupply the Defect, or imitate and produce the ſame Effects, you might expect elſe from the Rain and Snow-Water.

It is alſo very well worth our Obſervation, That in caſe you have proceeded according to theſe Directions, you will after ſome Time be ſenſible, about Noon, when the Sun is at the higheſt, of a certain ſulphureous Smell, ariſing from the ſulphureous Exhalations of the Slates, after they have been ſo often wetted and dried: And what is more, this Scent is not only plainly obſervable near the Place where this Table with the Fragments of the Slates and with the Bones is placed, but alſo at a conſiderable Diſtance from thence, where you may perceive a Smell not unlike that of burning Brimſtone. If you continue your Operation thus, as you ought to do, till the next Autumn, you will find this ſuperficial Calcination of the Bones (if I may make uſe of this Chymical Term of Art) accompliſhed, and brought to its full Perfection without the leaſt Detriment to the Bones, which are not render'd friable in this Operation, as the Hart's-Horn is by the Philoſophical Calcination. Theſe Horns may be ſtripp'd off their black gliſtering *Cortex*, or Incruſtation, if you only macerate them in a proper and capacious Veſſel for ſome Days in Rain-Water, ſo that you may eaſily afterward ſcrape off this Rind, and that ſo nicely, that to any one that is ignorant of the Matter, it would ſeem as if they had been managed by a Philoſophical Calcination, with the Help of a gentle Heat and Water. And as the Slate contains not only a Salt of its own Kind, but alſo a conſiderable Quantity of Sulphur; ſo it happens ſometimes, that if there are any adjacent Houſes cover'd with Slates, they will not bear the cold Water, but will break to Pieces with ſuch Violence, that the Fragments will flie into your Face.

I will add no more at preſent concerning this Operation of the Whitening of the Bones, becauſe I intend (if GOD is pleaſed to grant me Life and Health) to treat of it more at large hereafter: In which Tract I intend to treat alſo of the Coction or Boiling of the Bones, and in what Manner it ought to be managed to the beſt Adnantage. I have alſo an Intention in due Time to publiſh an *Ichnography*, and Deſcription of certain Inſtruments, ſome of which are of my Invention, others taken from thoſe uſed by the Watch-makers and Turners, belonging and neceſſary to the Terebration of the Bones, the clearing of them of their Marrow, the ſhaving and poliſhing of them, in order to their due Preparation for the Compoſition of a Skeleton, with all their proper Uſes, and this not only in the Bones of the humane Body, but alſo of divers other Animals.

We muſt not forget to add, out of the before-mention'd *Acta Hafnienſia*, that the Skeletons, compoſed of theſe white Bones, muſt not only be kept clear from all Duſt, but alſo in a very dry Place; nothing being more obnoxious to them, than the Moiſture of the Air, or any Thing elſe that is wettiſh; as has been found by reiterated Experience.

Dr. SIMON PAULI's *Obſervations relating to the Coction or Boiling of the* Bones, *for the Compoſition of a* Skeleton; *and more eſpecially to the due Management of the* Sternum *for the ſame Uſe.*

BEfore I enter upon the Point in Hand, concerning the Coction of the Bones, it ught to be obſerved, that the Bones of all e Animals, whether Two-footed or Fourooted, or of the Feather-kind, when they e but lately brought forth, or very oung, are very unfit for the Compoſition of a Skeleton, becauſe their *Epiphyſes* are very apt to ſplit whilſt they are boiling, or perhaps quite to ſtart from the Bones. Not to mention here, that they are very ſpongious or porous, and not near ſo ſolid as thoſe in Animals that are arrived to an Age of Maturity; and in their Coction they commonly turn to

an Aſh-colour; though for the reſt, if they are made ſmooth, and poliſh'd by Art, they will look very fine and clear.

But to come to our main Point: When you propoſe to boil the Bones of a dead Carcaſs, you muſt flea and eviſcerate it; which done, you muſt take off both the ſuperior and inferior Limbs: Then it is Time to lay hold of the *Sternum*, which you muſt take Care to ſeparate entire from the Body by the Help of your Diſſecting-Knife. When I ſay entire, I conclude within the Name of the *Sternum* the Cartilages of the Seven true Ribs of the *Thorax*, which are join'd with it. For the Cartilages of the ſpurious Ribs, you muſt, after they are cut out, keep by themſelves, and manage them according to Art. (Here I muſt refer my Reader to that whole Paſſage of *Veſalius*, together with what precedes and follows; Part whereof you will find tranſcrib'd by me hereafter:) which done, you may, after you have expoſed the Bones to the Air, (of which we have ſpoken already) and given them a pure white Luſtre, you may reduce theſe Cartilages to their former Poſition, and by the Help of a Braſs Wire unite them again to the ſpurious Ribs; though it is a great Rarity to ſee theſe Cartilages annexed to the ſpurious Ribs in any of our Anatomical Theaters.

This being done, you muſt come to the Head, and begin with the *Cranium*. Now as to what relates to the humane *Cranium*, becauſe of the great Quantity of the Brain, in which it exceeds all other Animals, it muſt be ſeparated by the Help of a Saw, ſomething above half a Foot long, made of the beſt Steel, with very ſmall Teeth, not unlike unto thoſe we obſerve in the Wheel of a Watch. After you have cut the *Cranium* aſunder, you muſt take out the Brain.

But before you go about this Diſſection of the *Cranium*, you muſt take care firſt to clear it of the Skin, without breaking the *Oſſa Jugalia*, and to ſeparate the Temporal Muſcles on both Sides. This done, you muſt have at hand a good ſtrong Packthread, which, after you have blacken'd it well, by drawing it often through a Piece of Charcoal, you muſt tie it round the Head three or four times, by which Means you may make ſuch an Impreſſion or Mark upon the *Pericranium*, as will ſerve you for a Rule whereby to guide your Knife in the Diſſection of the *Pericranium*, and conſequently afterwards to your Saw, which without ſuch a Guide would deface the *Cranium*, by cutting it awry and in Notches.

And 'tis for this ſame Reaſon that thoſe Saws that are commonly uſed by Chirurgeons in the Amputation of corrupted Bones, are altogether unfit for this Operation, becauſe it would produce Notches on the Edges where it is cut aſunder. However there is no Occaſion for ſuch a Saw, as has been juſt now deſcrib'd, (which may very well be call'd the *Cephalick Saw*) for the opening of the Heads of other Animals; for they containing but a ſlender Portion of Brain in Compariſon to what the humane *Cranium* does, the ſame may, by the Means of certain Inſtruments contriv'd for that Purpoſe, be taken out of the firſt and great *Foramen* of the *Occiput* before the Bones are boil'd, in the ſame Manner as the Cooks ſometimes take out Butter out of a deep and narrow Veſſel with a Scoop.

The Head being taken off, the next Thing you have to do, is to ſeparate the Seven *Vertebræ* of the Neck from the Twelve *Vertebræ* of the *Thorax*, and theſe again from the Five *Vertebræ* of the Loins, and of the *Sacrum*, without impairing the *Apophyſes* of the *Vertebræ*. This done, take the Carcaſs as it is divided into its Parts by Diſſection being as yet covered by their Muſcles, and clear them of all the Fat, and waſh them ſeveral Times in fair Water. The next Thing to be done is to lay them for ſome few Hours only in Rain-Water, or for want of ſuch, in Spring or any fair and clear Water, which, after they have been thus macerated, you may throw away, and afterward put the diſjointed Bones, covered ſtill with their Fleſh, into a Braſs Kettle, that will contain ſeveral Pails of Water, (according to the Bigneſs of the Animal unto which the Bones did belong) and then pour as much Water upon them as will cover them very well, and make it boil hard. You muſt be very careful to take off all the excrementitious Scum, as well as the Marrow of the Bones, which ſweating through the *Epiphyſes*, will ſwim upon the Surface of the Water.

You muſt take eſpecial Care not to pour into the Kettle any cold Water whilſt it is boiling; but if you caſt a Supply of Water to make good what is evaporated during this Coction, you muſt provide ſome that is hot; for unleſs you take care of this Point, you will be diſappointed in your Expectation of having the Bones neat and clean for your Purpoſe. You muſt alſo be no leſs careful not to ſuffer any, not even the leaſt Part of the Bones, to remain above the Surface of the boiling Water in the Kettle, for whatever ſtands above the Water, will ſoon change, and look not well.

There is another Thing very well worthy our taking Notice of, to wit, that you muſt tie up the Hands and Feet, after they have been cleared of the Skin, in thin Linen Cloths, and boil them in a Kettle by themſelves, becauſe they are fuller of Marrow than any of the other Parts: Beſides that, by ſo doing you prevent any of the ſmaller Bones being loſt, and their being interchanged, *viz.* the Right inſtead of the Left. 'Tis alſo very convenient to tie every one of the Ribs with a Packthread, and that ſo, as to place each of them in the ſame Order as they are taken off of the *Vertebræ* of the Spine on either Side; unto which you may add alſo the Clavicles each on its Side.

This Method I have preſcribed to you, relating to the Coction of the Bones, muſt be underſtood chiefly of thoſe humane Bones which belong to Perſons that did not die of any Diſtempers, but by a violent Death; as likewiſe of the Bones of Oxen, Horſes, Lions, Wild Boars, Stags, and Dogs, all which may and muſt be boiled ſo long till their Fleſh ſhrinks quite together, or till you ſee the Bones to begin to be cleared of their *Perioſtea*, and tha the Fleſh, as well as the Membranes, Ligaments, Nerves, and Tendons, are become ſo tender, and as it were friable by this Coction, that without the Help of any Anatomical Knife, they may eaſily, with your Hands only, be ſeparated from the Bones.

When you find them thus far fitted for your Purpoſe, 'tis then high Time to make what Diſpatch you can (but don't forget once more firſt to take off the Scum off of the Water) to pull out the Parts out of the boiling Water, and then only clear them of the Fleſh ſuperficially; but ſoon after rub and cleanſe them well with coarſe Linen Cloths, heated before the Fire, and wind them up cloſe in them, that they may become dry gradually, eſpecially in the ſharp Winter Seaſon. From what has been ſaid it is evident, That 'tis next to an Impoſſibility to preſcribe or limit any exact Time or Number of Hours, in which theſe Operations may or muſt be performed as they ought to be, ſince, according to the Variety that is obſervable in thoſe Animals whoſe Bones are to be boiled, they require either a longer or a ſhorter Time; an Obſervation which has been made already long ago by that incomparable Anatomiſt and a Second *Democritus* of the laſt Age, I mean, by *Veſalius*, who ſays, That it is to no Purpoſe to limit the Coction of the Bones to any certain Time, becauſe it depends on the great Variety there is betwixt the different Ages of the Perſons unto whom they did belong: And I judge we need not be very ambitious in this Point, if we are not ſo exact in our Coctions as the Cooks are in theirs.

But to omit nothing that may ſeem to conduce toward the true Management of the Bones for the Compoſition of a Skeleton, I will produce the incomparable *Veſalius* here for my Second: And as I am ready to own, that I have followed his Footſteps in many Things here, ſo I will inſert a Paſſage of his relating to the Management of the Bones, and the Cartilages of the *Sternum*, which may juſtly challenge our peculiar Attention.

'Now (ſays he) I am beginning to 'cleanſe with all poſſible Care the Breaſt-'Bone, and the Cartilages which are an-'nexed to it, which will require ſo much 'the more Time, becauſe it is inveſted with 'many Membranes; beſides that, it is very 'fat, and ſo far from being fit to be boil'd, 'that it will ſcarce admit of being dipp'd 'into warm Water. When you ſeparate 'the Fleſh from the Cartilages, you muſt 'take eſpecial Care not to take off at the ſame 'Time the Membranes which immediately 'inveſt the Cartilage, as alſo that which we 'call the *Circumoſſea*; for in caſe this Mem-'brane be torn off of the Cartilages, they 'loſe in part their firm Connexion with

'the Breaſt-Bone, and they are contracted, 'and become ſhort and contorted. Fur-'thermore, to avoid this Danger of con-'tracting the Cartilages, you muſt not dry 'the Breaſt-Bone before the Fire, but you 'muſt take Care to put it where it is not 'kept too moiſt neither, for fear the Carti-'lages ſhould become quite flaccid and re-'laxed, and conſequently when you come 'to the Erecting of your Skeleton, they 'introduce a Deformity in the Fabrick of 'the Bones of the *Thorax:* For there is 'ſcarce any Thing that I know of, which 'is ſo likely to vitiate the whole Compoſi-'tion and Elegancy of a Skeleton, than if 'the Breaſt-Bone, and its Cartilages, are 'not managed with due Care and Circum-'ſpection.

Thus far *Veſalius.* Now there is nothing in this World I am ſo averſe to, as to be thought guilty of the leaſt Ingratitude towards ſo great a Man, unto whom I own my ſelf indebted for his oral Inſtructions in Anatomy, becauſe he does not agree with me in this Point of the Preparation of the *Sternum:* Nevertheleſs, as one Day teaches the other, (as the old Saying is) I hope I may ſay it without Vanity, or without being injurious to ſo great a Man as *Veſalius*, that I think I have found out a far different and better Way from his to manage the *Thorax* in the Compoſition of a Skeleton.

For as I am taught by Experience readily to ſubſcribe to that Part of *Veſalius*'s Direction, when he forbids us expreſly not to boil the *Sternum*, which will ſcarce bear the warm Water; ſo reiterated Experience and Uſe declare abſolutely againſt *Veſalius*, in that Part where he tells us expreſly, not to dry the *Sternum* before the Fire.

For if you intend to manage the *Sternum* to the utmoſt Advantage, you muſt firſt of all cleanſe it very well of all Impurities, and then macerate it in fair Water; after this you muſt wipe or rub it gently with dry and clean Linen Cloths, and ſpread it upon a broad Table or Board, covered with theſe Cloths, for ſome Days, till it becomes pretty dry; and great Care muſt be taken to preſerve its Membranes entire. When you obſerve it to be pretty dry, but nevertheleſs ſomewhat ſlippery ſtill, by reaſon of the oily Subſtance it contains, you muſt hang it up by Means of a Braſs Wire in the Corner of a Chimney, near a very gentle Fire, and ſo let it dry very well by degrees. Whilſt this is doing, you will find the Cartilages which adhere to the *Sternum* to turn or bend themſelves upwards and downwards, as well as to the Sides, till at laſt they grow very rigid and ſtiff. You muſt not pretend to bend or reduce them to their natural Poſition, but let them alone for this Time: Neither will I be againſt it, if you have a Mind to bury the *Sternum* in the Summer-time in fine Sand, much after the ſame Manner as I told you before concerning the Bones of the *Carpus* and of the *Tarſus*; for neither the *Sternum*, nor its Cartilages, will receive the leaſt Detriment by it: And ſo far are they from being impaired by their Exſiccation near a gentle Fire, (I ſay a gentle Fire) that by this Means they are preſerved from all Corruption, and from the Worms, which are otherwiſe very apt to eat ſmall Holes into them.

Thus much concerning the *Sternum* and its Parts, and their Preparation for the Compoſition of a Skeleton. 'Tis now Time we ſhould return to the Bones of the Limbs. Theſe, after you have for ſeveral Days, or rather Weeks, let them dry gently and gradually of themſelves, as well as the Heads and *Epiphyſes*, you may take (as for Inſtance) the *Os Humeri* and the *Os Femoris*, and open them by Terebration, and by the Help of certain Inſtruments made for that Purpoſe, (of which, more at another convenient Time) endeavour to clear them of all the Remainder of the Marrow that was not boil'd out in their Coction, and at the ſame Time take Care to ſhave and clear the *Epiphyſes* on the Inſide. In the ſame Manner you muſt proceed with the Bones of the *Pedium* and the *Metapedium*, of the *Carpus* and *Metacarpus*, as likewiſe with thoſe belonging to the Fingers and Toes.

Every thing being prepared thus far, you muſt take the Head, the Skull, and all the other larger Bones, and among the reſt, thoſe call'd the *Oſſa Innominata*, and boil them once more, but not near ſo long as the firſt Time; and if there be any Occaſion, you may do the ſame Thing alſo with the leſſer Bones, as thoſe of the Ribs, the *Ver-*

tebræ,

tebræ, and those of the Hands and Feet; all which you must afterwards expose (as has been shewn before) for several Months successively to the Air and the Sun for their Dealbation.

The *Os Sacrum* being so light and porous, that sometimes it will swim upon the Water, requires the least Boiling of all: Neither will the Head bear any violent Coctions, by reason of the different Nature and Temperature of the Bones of which it is composed.

I am obliged to give you this Caution also in respect to the Bones of the Extremities of Four-footed Beasts, as those of the Feet with their Hoofs, that they must not be boil'd at all; but after they are wash'd very well, and clear'd of their Membranes, Tendons, *&c.* you must dry them, by laying them upon a Baker's Oven when it is but just warm.

The *Tibiæ* also of the Birds are not to be boil'd, but their Feet being fasten'd to them with Brass Wire, they are to be plac'd in their natural standing Posture upon a Board, and thus to be dried either in the Air or by the Sun. In the same Manner you may proceed with the Bones of the Feet of such Animals as have them like the *Tarsus* in Men; as for Instance, of the Stag, as also of those that have Teeth on both Sides, as Dogs, and whose Feet are divided into Toes: These you must cut off at their Legs, and just as you find them, with their rough hairy Skin and all, (after you have wash'd them very clean) dry them, as beforesaid, over an Oven, without any Coction, or other Preparation.

Lastly, and by Way of Conclusion, I will oblige the young Students in Anatomy and Chirurgery with another very necessary and most curious Observation, to wit, that whenever they are resolved to reunite the *Sternum* with the Ribs, by Means of Brass Wires, for the Erecting of a Skeleton, and the framing of the *Thorax*, especially in its most natural Shape, they must once more macerate it before-hand in fair Water, when they will find the Cartilages of the *Sternum*, which were contracted before on all Sides, to give way and expand themselves gradually, till at last they return to their natural Position and Figure. But at that very Nick of Time when you find the *Sternum* so flexible, you must take care to rub it gently and dry it softly with a clean Linen Cloth; and this must be done with all possible Dispatch; for unless you fasten the *Sternum*, the Ribs, and the Cartilages, together with the Brass Wire, before they begin to turn rigid and inflexible again, you lose all the Time and Labour you have bestowed upon this Part of the *Skeleton*.

Of the *SCELETOPOEIA*, or Erecting of a Skeleton. By *Michael Lyserus*.

The INTRODUCTORY DISCOURSE.

Before a Student in Physick proceeds to the Inspection of the Anatomy of the whole Body, he ought to be perfectly well instructed in the Doctrine of the Bones, without which he will be much at a Loss in the Originations and Insertions of the Muscles, and of the other adjacent Parts, and the Receptacles of the Bones; unless, I say, he be perfectly well acquainted with the *Osteology*, which *Hippocrates*, and after him, *Galen*, have made the First Foundation of the Study of Anatomy. And *Riolan*, that great and famous Anatomist, invites all the young Students to apply themselves to the Doctrine and Study of the Bones with all possible Assiduity.

Now

Now ſince no Body can pretend to become a learned Phyſician by reading only, we ought to make it our Buſineſs (to ſpeak with *Galen*) to attain to the Knowledge and Diſtinction of every particular Bone in the humane Bodies, not only by Reading, but alſo by Inſpection and ocular Demonſtration. And becauſe one cannot at all Times be conveniently ſupplied with freſh Bones, ſuch as are fit for ocular Demonſtrations, and that our Memory proves very often fallacious, we being apt to forget Things, which, though once ſeen, do not always occur to our Senſes again, therefore humane Induſtry has invented a Supply or Remedy for this Defect, and put us in a Way how to dry up all theſe Bones, and afterward to preſerve them, that ſo by having frequent Opportunities, and as it were accuſtoming our ſelves to look upon them, this Repetition (as we may ſay) of the Bones may make the deeper Impreſſion in our Minds. That this was the Practice of the moſt ancient Ages, is manifeſt from the Commentaries of *Galen*, who uſed to have theſe exſiccated Bones at hand together with their proper Ligaments, in the ſame Manner as that Skeleton formerly to be ſeen at *Padua*, contrived and made up by *Francis Frigemelicus*, and mention'd by *Columbus*, and another like that ſtill to be ſeen at *Venice* in the *Anatomical Muſæum* of *Folius*.

In our Age, wherein moſt, if not all the Arts, are much better cultivated than in former Times, and are as it were brought almoſt to their utmoſt Perfection, this Art alſo of preparing Skeletons has not lain altogether neglected, but advanced to ſuch a Degree, that ſcarce any Thing can be ſuperadded to it. Dr. *Simon Pauli*, unto whom I acknowledge my ſelf highly and for ever obliged for his Inſtructions in Phyſick, being a Perſon of uncommon Sagacity, has by his continual Speculations and indefatigable Pains render'd his Name famous in this particular Point, which he has advanced to ſuch a Perfection, that the Bones of his Skeletons look as white as the beſt Ivory.

That therefore the young Students in Phyſick may not be deſtitute of a Method how to prepare theſe Skeletons, I will repreſent the *Enchireſis*, or Manual Operation of this Art, in as ſuccinct a Manner as poſſibly I can. And here it is to be obſerved, that as in Anatomical Diſſections, you ought, as much as lies in your Power, to pitch upon ſuch a dead Body as is moſt proper for that Purpoſe; ſo in the Preparation of a Skeleton, you muſt not lay hold of any Sort of Bones you firſt meet with, but chooſe thoſe of ſuch Creatures as are pretty well advanced in Years, and conſequently have acquir'd a greater Degree of Solidity. I know *Columbus* is of a contrary Sentiment, and adviſes us to pitch upon thoſe of the Body of a young Perſon, and that of a mean Stature; but he is in the Wrong, becauſe theſe Bones are not durable, but very apt to contract a *Caries*. 'Tis true, nothing is more common than to ſee the Anatomical Theaters, as well as *Muſæums*, very well ſtor'd with the Skeletons of young and new-born Infants; but theſe are kept rather for a Shew or Ornament, than for Uſe; and theſe muſt be prepared in a different Manner from the others: Of which, I ſhall ſay ſomething hereafter by Way of *Appendix*.

The Preparation of a Skeleton requiring a Two-fold Operation, *viz.* firſt to cleanſe the Bones, and next, after they are cleanſed from what is foreign to them, to ſet them together again, I intend to divide this Tract into Two Chapters; the Firſt whereof ſhall be as follows.

CHAP. I.

Of the Cleanſing *of the* BONES.

TO cleanſe the Bones of a dead Body of all their Impurities, is not to be done at once, but requires ſeveral different Operations. Firſt of all, becauſe it is very hard to meet with ſo large a Veſſel as is capacious enough to contain the whole *Compages* of the Bones, they muſt be disjoin'd, and divided into ſeveral Parts. Secondly, becauſe there is an unctuous Marrow encloſed within the Bones, which, if not taken out, will

into their Subſtance, and ſticking to the Outſide, will either diſcolour them, or gather abundance of Duſt: And to clear the Bones of the Blood, they muſt be macerated in Water. After this, becauſe the Fleſh and Ligaments can ſcarce be ſeparated from the Bones without a previous Coction or Boiling, they muſt be boil'd over the Fire. And laſtly, after they are boil'd, you muſt clear them of every Thing that does not belong to them. That all theſe Things may be done in due Method and Order, I will treat of each of them in particular in this Chapter.

Firſt, you muſt disjoin the Bones, and divide them into certain Parts, *viz.* the *Trunk*, and the *Limbs*. The Limbs may be bent together, and put into a Kettle: But in order to clear them of the Fat, which muſt be done by Way of Perforation, they muſt be taken aſunder.

You muſt begin with the Arm, which you muſt ſeparate from the *Cervix* of the *Scapula*, by cutting aſunder with a crooked Knife the Ligaments by which it is join'd together. Next you muſt ſeparate the *Humerus* from the *Cubitus* and the *Radius*, beginning with the *Radius*, and cutting of that Ligament by which it is join'd to the *Humerus*, and which ſurrounds its round Protuberancy. Then you muſt bend the *Humerus* and *Cubitus* together, by which Means you will ſee the *Radius* to open in that Place where you have made your Section before, and of Courſe ſhew you the Way where to continue your further Diſſection. The Hand muſt be taken off thus: Inveſtigate exactly the Place where the *Carpus* is joined to the Outſide of the *Radius*, by bending the Hand forward and backward; which done, diſſect the Ligament in that Place in a tranſverſe Line, and then bending the Hand toward the Cubit, and going forward with your Knife toward the Thumb, you will at laſt come to the interior Region of the *Carpus*, which you muſt cut off, and take away. The Bones of the *Cubitus* and of the *Radius* may be ſeparated, if you thruſt your Knife betwixt them, and let it paſs through it both below and above.

Next to the Hands, you muſt divide the Feet alſo into Three Parts. The Head of the *Femur*, or Thigh-Bone, you muſt turn outwards and backwards, and with your Diſſecting-Knife cut aſunder thus far the Ligament by which it is annexed to the *Acetabulum*, that you may pull or thruſt it out of the great *Epiphyſis*. Then pull the Bone backwards from the *Acetabulum*, and with a long Inciſion-Knife cut off the long, interior, ſtrong, and ſolid Ligament, as well as the other Membranes, till you are able to remove the Bone without any further Obſtacle.

Next you muſt come to the *Tibia*, by ſeparating the Kneepan from the Thigh-Bone, and making a Diſſection, firſt in both the lateral Ligaments, then the middle one, and laſt of all in the other lateral Ligament and the Membranes. Betwixt theſe lies a *Cartilage*, which *Columbus* and *Fabricius* preſerve by it ſelf; but you may leave it on the *Tibia*.

The Separation of the Foot, properly ſo call'd, muſt be performed thus: Extend the Foot as much as poſſibly you can, and then make an Inciſion in the Ligament on the fore Part in the Flexure: Then convey your Razor under the exterior *Malleolus*, or outer Ankle-Bone, and continue your Section till the Foot remains coherent only on the oppoſite Side. The reſt is ſoon managed without any further Direction.

From the *Tibia* you muſt ſeparate alſo the *Fibula*, being a Bone peculiar to it ſelf, by making a Diſſection lengthways in the inferior Part, and an oblique one on the ſuperior; becauſe it is conjoin'd with the *Tibia* obliquely under the ſuperior *Epiphyſis*.

The Trunk of the Body is moſt commonly divided into Five Parts; but to ſave you what Trouble I can, Three will be ſufficient.

The Firſt Part is the *Head*: This you muſt bend forward, after having taken off all its Muſcles, if any of them are ſtill remaining, and diſſect the Membrane which extends from the Head to the Neck: Then turn the Head on both Sides, and near the *Proceſſus Maſtoides* trace its Conjunction, which you muſt cut aſunder with your Knife, and repeat the ſame Operation on the oppoſite Side. Here you muſt take heed not to break the *Proceſſus Styliformes*, or *Appendices*, which lie concealed hereabouts.

Columbus makes his Section betwixt the Third and the Second *Vertebra*, which is the leaſt

leaſt troubleſome. Some caſt the *Vertebræ* of the Neck by themſelves into a Kettle; but I am for leaving them together with thoſe of the *Thorax*. *Columbus* alſo ſeparates the Ribs from the *Vertebræ*, and after having tied them together in their due Order, puts them into the Kettle; which I look upon as ſomewhat troubleſome, and at the ſame Time as uſeleſs; nay, oftentimes it proves noxious, becauſe it may eaſily happen that ſome of the Extremities of the Ribs are broken.

The Second Part is the Neck, with the *Thorax*, or middle *Region* or *Venter*, which muſt be ſeparated from the *Vertebræ* of the Loins. You muſt therefore number Five *Vertebræ* upwards from the *Os Sacrum*, and betwixt the Fifth and the next following, being the laſt *Vertebra* of the *Thorax*, thruſt in your Mirtle-like Knife, and cut aſunder the Cartilage and the Spinal Marrow: Then turning the Body, diſſect alſo the Ligament by which the Spines of both the *Vertebræ* are join'd together. Then extend and pull the Trunk as much as you can, and bending it a little on either Side, ſeparate the tranſverſe Proceſſes, but not without a great deal of Caution, becauſe they are as it were inarticulated with each other, and therefore if roughly managed, are ſoon impaired. Here obſerve, that the uppermoſt enter the *Sinus's* of the lowermoſt. After you have once removed the *Lumbar Muſcles*, you can't well miſs the Place where to make your Diſſection.

The Bones being thus diſunited, you muſt now take out the Marrow; but this you need not do with all of them, but only with thoſe of a larger Size, belonging to the Limbs, which abound in this unctuous Subſtance, *viz.* the Bones of the *Cubitus*, the *Humerus*, of the *Radius*, the *Thigh*, the *Tibia*, and the *Fibula*: Unto which, *Columbus* adds the *Jugulum*, or the *Clavicula*, as alſo the *Oſſa Poſtbrachialia*, the *Metapedium*, and thoſe of the Toes and Fingers; but of late Years we don't give our ſelves the Trouble of taking the Marrow out of theſe Bones. To perform this Operation, you will ſtand in need of Two Sorts of Inſtruments, *viz.* of a Wimble, and of a Stick.

As to what concerns the Wimble, marked with I. you muſt take Care to be provided with ſeveral of them, of different Magnitudes; becauſe the thicker Bones require a larger Wimble, and the thinner a leſſer. The Sticks I mention'd muſt be round, and made either of Wood, or of Iron, or at leaſt, pointed at the End with Steel. They muſt be anſwerable in Thickneſs to the Wimble, becauſe they are to be thruſt into the ſame Holes that have been made before by the Wimble. It would not only be proper, but even highly neceſſary to this Operation, to make uſe upon this Occaſion of that ſame Inſtrument wherewith the Gunſmiths cleanſe the Barrels of their Guns, call'd a *Kratzer*, or *Scratcher*, by the *Germans*, and might in *Latin* perhaps be expreſs'd by the Word *Rudula*, mark'd with II.

Being provided with theſe Inſtruments, you muſt then proceed to the Perforation of the Bones: But becauſe the Point of the Wimble is apt to be blunted if it lights upon a Ligament, near which, or perhaps through which, ſometimes it is to be perforated, theſe muſt be removed. 'Tis alſo of Conſequence to chooſe a fit Place where the Wimble is to be fixed, partly for the better Conveniency of bringing the Marrow out of the Bone, partly to prevent, as much as poſſibly may be, the deforming of the Bone: The Method whereof I intend to comprehend in the following Rules.

The Head of the *Humerus* muſt be perforated on the uppermoſt Part, ſo that the Perforation go in a direct Line to the *Fiſtula*, or Hollowneſs of the Bone. In the lower Part this Perforation is to be made on the back Part, where you ſee a ſuperficial Cavity: You muſt firſt ſeparate the *Periоſteum*; but you will find this laſt a very difficult Operation.

The upper Part of the *Cubitus*, or the *Olecranon*, is the moſt proper Place for Perforation; but in the lower Part you muſt perforate it near the *Proceſſus Styloides*, where it lies ſomewhat concealed, and produces a Ligament, which muſt be removed. The *Epiphyſes* of the *Radius* muſt be perforated in the Middle both above and below.

To make your Perforation in the upper Part of the Thigh-Bone ſucceed the better, you muſt take care to cleanſe very well that Cavity which is at the greater *Trochanter*, in which the Tendons of the *Quadrigemini* are

are inſerted: After which you may make uſe of your Wimble. In its lower Part you muſt make your Perforation in the Middle of the *Sinus*, which owes its Origin to the Protuberancy of the *Epiphyſes*.

You muſt firſt remove from the *Tibia* that round Ligament by which it is faſten'd to the Thigh-Bone, which muſt be the Place where to make your Perforation on the upper Part. On the lower Part you muſt do it directly oppoſite to it.

The *Fibula* is perforated in that Place where it is joined to the *Tibia*, and where it is very ſmooth, by reaſon of the *Cartilage* that covers it. In the lower Part there is a ſmall Cavity at the *Malleolus Externus*, where you muſt fix your Wimble, after having clear'd it of the Ligaments and Membranes. Your Perforations or Terebrations being thus accompliſhed, you muſt now come to the taking out of the Marrow. Thruſt therefore a Wooden or Iron Stick into the Bone, and pull it forwards and backwards ſo often, till the Fat and Marrow be brought out on the oppoſite Hole. Then fit your before-mention'd *Radula*, or Scraper, to a Stick, and put it within the Bone, preſſing it together with your Fingers, which afterward being dilated again, will conſequently clear and ſcrape the Remainders of the Marrow from the Inſides of the Bones, which afterward you may thruſt out again by the Help of one of your Sticks. 'Twould alſo be not amiſs to convey a ſtrong crooked Iron Wire into the Concavity of the Bones, in order to break aſunder the ſpongious Subſtance of the *Epiphyſes*, and to caſt them out.

Preſerve this unctuous Marrow carefully in a Glaſs after its Extraction, it being of good Uſe, and therefore not to be thrown away, as *Hildan* has very well obſerved. It muſt be kept in a warm Place, ſo that the fleſh Subſtance may diſſolve, and caſt the Dregs to the Bottom, from whence the melted Fat may be ſeparated afterward by Inclination of the Glaſs.

Thirdly, after you have taken out the Marrow, put the Bones into Water; for becauſe ſome of them have as yet ſome Remnants of the Fleſh upon them, ſome are bloody, and ſometimes there is Blood contained in the Bones, this muſt be taken out by macerating them in Water: For I have obſerved, that ſuch Bones as have been boiled immediately, (without any previous Maceration) retain a Kind of Aſh-colour, which thoſe that have lain for ſome Time in Water will not do: Which makes me imagine, that this Maceration of the Bones that are perforated by the Addition of certain Liquors, conduces very much toward the giving them a white and bright Colour. But of this, more perhaps in another Place.

Therefore after you have put your Bones into a capacious Veſſel, pour ſome very clear Water upon them, ſo that the Bones be at leaſt a Hand broad under Water, which you muſt change once at leaſt, or rather twice, every Day. Here you muſt alſo obſerve, that in the Winter Seaſon, eſpecially in Froſty Weather, this Extraction of the Blood out of the Bones is ſubject to ſome Difficulties; and therefore the Veſſel muſt either be put in a warm Place, or elſe you muſt put warm Water upon them. They muſt be kept thus in Maceration for Three or Four Days ſucceſſively, or at leaſt ſo long, till the Bones are become white, and that you ſee the Water not to take out any further Tincture.

Now you muſt proceed to the Fourth Operation, which is the Manner of boiling the Bones over the Fire, excepting the *Sternum*, which being ſo very tender, will not admit of the leaſt Coction. *You ought to take Notice, concerning the* Sternum, *and the Cartilages, that they muſt not be put into the Kettle, nor boiled; but after you have macerated them, expoſe them to, and dry them in, the Sun, and ſo keep them.* Says *Columbus*, *Riolan* excepts alſo the *Os Hyoides* and the *Os Coccygis* from boiling, but without juſt Ground; for the laſt receives no Detriment in the boiling; and the other being not continuous to any Part of the Skeleton, ought not to be faſten'd to it; and therefore 'tis in vain to give any Directions about it: Though if you have a Mind to make it abſolutely clean, you may perhaps beſt do it by boiling it a little.

Many other Things are to be conſidered in the boiling of the Bones: Firſt, *Riolan* expreſly orders us to put the Bones into hot Water; it being his Opinion, that by ſo doing the boiling is much forwarded. And *Columbus* tells us, that this will make them

tlie whiter. You muſt alſo put ſo much Water in your Kettle, that the Bones be covered a good Way, becauſe the Bones will not lie immoveable at the Bottom of the Veſſel, but move up and down by the violent boiling of the Water, and conſequently will often riſe up to the Surface of it; which when you perceive, you muſt keep them under with a *Spatula*, for fear they ſhould be touch'd and tainted with a yellow Colour by the Smoke. You may alſo put the Feet and Hands, each apart, in a Linen Cloth; for when the Ligaments are diſſolved by Coction, their Joints will come aſunder. And becauſe there ariſes a very thick and abundance of Scum to the Top whilſt you are boiling, this muſt be taken off with a Ladle, the better to cleanſe the Bones of all Manner of Filth.

In this Coction abundance of Fat is alſo brought out of the Bones, as well as the Fleſh, which you muſt take care that it may not again be inſiccated into them, and therefore take it off with a Spoon, and keep it, it being of moſt excellent Uſe in a great many Caſes, as *Columbus* tells us.

Laſtly, due Regard muſt alſo be had to the Time, though it is very hard to aſcertain it exactly, becauſe it muſt be regulated according to the Conſtitution of the Bones, in which there is no ſmall Variety. *Riolan* appoints Four or Five Hours for the boiling of the Bones: But *Columbus*, with much more Reaſon, tells us, that you muſt boil them till the Fleſh falls of it ſelf from the Bones. Wherefore, after the Bones have boiled for Four or Five Hours, (I ſpeak of thoſe belonging to a Perſon of above One and twenty Years old) take out one of them, the firſt that comes to your Hands, and try whether it be boil'd enough: If you find it is, begin now the cleanſing of your Bones; but if not, put it into the Kettle again, and let them boil till they are. But you muſt never make this Trial in one of the Rib-Bones, becauſe the Fleſh will ſoon come off of them in the boiling; but the beſt Way is to try it at the *Epiphyſes* of the larger Bones. As to the Time of their Boiling, you may however take this for a general Rule, That the Bones of young Bodies are ſooner boil'd than thoſe of old People; a Thing ſufficiently known to and practiſed even by our common Cooks, who, taught by Experience, always allow more Time for the boiling of the Meats of old than of young Creatures: For if you overboil the Bones of a young Perſon, it ſpoils them in a great meaſure, becauſe they will become too tender, and break in thoſe Parts where they are porous whilſt they are a cleanſing, as I have my ſelf found it by Experience. However, you muſt boil the Hands and Feet ſomething longer, in order to boil out of them moſt of the Fat, if not all, wherewith they abound.

Fifthly, after the Bones are boil'd, they muſt be cleanſed alſo of their Impurities.

I told you not long before, That you ſhould macerate the *Breaſt-Bone* in Water, and not put it into the Kettle with the reſt, to boil it; wherefore after it has lain in Water for Three or Four Days, take it out, and cleanſe it without any previous Coction.

Some, I know, will put it for a Moment or Two in Scalding Water, the better to clear it of the Membranes, but I think they are in the Wrong. *Veſalius* is of my Opinion; for he forbids not only the boiling, but alſo the dipping of it in hot Water; it being rather noxious than proficuous to take off all the Membranes of the Cartilages, becauſe they will ſplit and break aſunder; and if you join them together with Braſs Wires, they disfigure the Compoſition of the Bones: *For* (as *Veſalius* well obſerves) *there is nothing that ſo much impairs the Elegancy of the whole Compages of a Skeleton, as when the Breaſt-Bone, with its Cartilages, is managed in a careleſs Manner.* If it were requiſite to clear the Cartilages of the Membranes, I could find out a better Way of doing it without boiling; but now only ſeparate the Membranes from the Breaſt-Bone, but not from the *Cartilages*, in the following Manner.

I make a tranſverſe Inciſion on the upper Part of the *Sternum*, through all the Membranes to the very Bone, and by Way of Abraſion ſeparate ſome Part of them from the Bone; which done, I take hold of that Part, and pull it very hard, extending it ſo as to make the interjacent Fibres, and which ſtick cloſe to the Bone, to appear plainly, which I ſeparate gently from the Bone, till I come to the Cartilage *Xiphoides*, which muſt be dealt withal with much Circumſpection,

ſpection, as well as all the other Cartilages: And after this I reiterate the ſame Operation on the oppoſite Side.

The Bone being now laid open, you muſt take off thoſe Cartilages with your Knife, which cover that Cavity which is framed by Nature for the Reception of the Heads of the *Claviculæ*. After this, you muſt ſeparate the Fleſh and Fat from the Cartilages of the Ribs, partly by Inciſion, partly by Way of Abraſion; it being impoſſible, or at leaſt very difficult, to give you a full *Idea* of this Operation by Words only: But thus much I cannot forbear to put you in mind of once more, That you muſt make your Beginning at the *Sternum*, and take Care not to cut aſunder or otherwiſe impair the Ligaments that join the *Cartilages* to the Bone.

And becauſe the Cartilages, as ſoon as they begin to dry, will either contract themſelves, or be diſtorted, and conſequently loſe their natural Form and Poſition, Care muſt be taken by ſome Means or other to keep each of them in its true Station and due Diſtance. To accompliſh this, take Two ſmall Sticks, which muſt be a little bent or crooked, and faſten or tie theſe Sticks at a certain Interval or Diſtance to the Extremities of the Cartilages, one Stick at each End, *viz.* at the ſame Diſtance as their natural Poſition is in the Body; ſo that, as they contract themſelves by degrees, you may draw the Thread together, after a Day or Two, in order to keep them as much as can be in their natural Poſition. When they are to be dried, put the *Sternum* rather in the Shadow or a cool Place than in the Heat of the Sun; for if they dry gradually, they will look much better and fairer, than if they are dried on a ſudden. *Veſalius* adviſes us to put or keep the *Sternum* in a moiſt Place, to prevent the drying up of the Cartilages before they are faſten'd to the Ribs: But if they cannot be put together in ſome ſmall Time, 'tis no great Matter if the *Sternum* be dried; for when you are to faſten it to the Ribs, it will return to its natural Form and Poſition, by dipping it into Water: And being thus render'd pliable, you may ſet it on the Ribs without any further Difficulty.

Thus much concerning the *Sternum*: The next Thing to be done is the cleanſing of the Bones.

I think it needleſs to enter upon a copious Harrangue or Deſcription of this Operation, daily Practice being the beſt Inſtruction in ſuch-like Caſes; and few are ſo ignorant as not to underſtand how to pick the Fleſh from the Bones. I will therefore add only thus much in general, that you muſt take effectual Care of the *Epiphyſes*, which being much tenderer than the reſt, may ſoon be impaired by the keen Edge of the Razor or Inciſion-Knife. You muſt alſo act with Caution in cleanſing or rubbing the Bones after they are boil'd; which is beſt to be done with a coarſe or rough, but very clean Linen Cloth, which will take off all the remaining Impurities; but don't rub too hard, eſpecially the *Vertebræ*, Ribs, the *Os Sacrum*, and their Proceſſes, for they are ſoon impaired. You muſt clear the Bones of every Thing that is foreign to their Subſtance, as the Fleſh, Membranes, Ligaments, and Cartilages. Conſidering this to be undoubtedly true, I am willing to confeſs, that I could never as yet rightly apprehend the Meaning of *Riolan*, who ſpeaking of thoſe Things that ought to be ſhewn in the dried Bones, reckons in the Third Place the *cartilaginous Incruſtations* of the Bones, and the Involucre of the Membrane *Perioſteum*: For if your Bones are rightly prepared as they ought to be, the Cartilages are taken off; for in the boiling they ſwell, and ſplit, and break: And to preſerve entire the *Perioſteum*, is a Thing impoſſible to be done, becauſe it will come off of Courſe, without any Help. Neither do I much reliſh *Columbus*'s Advice, who takes a great deal of Pains to tell us, that we muſt be very careful whilſt we are boiling the Bones, for fear of hurting the *Proceſſes* and *Cartilages* which lie over their Extremities: And at the ſame Time adviſes us to remove firſt thoſe Cartilages that can be taken off, the better to preſerve them from being impaired or loſt. I look upon all this Precaution as abſolutely uſeleſs, ſince, according to the Opinion of the ſame *Columbus* himſelf, the Cartilages muſt be diſcovered, and ſhewn on the Bone, before they come to be boil'd.

'Tis further obſervable in the cleanſing of the Bones, that the Skull and *Os Sacrum* require a Preparation peculiar to themſelves, and conſequently differing from the reſt by reaſon of their Inequality. Beſide, the *Os Sacrum* is ſomewhat bent, and contains the Extremity of the *Spinal Marrow*; and as well before as behind ſends forth divers Nerves through divers Perforations. It muſt therefore be cleanſed on the Outſide firſt, and then with an Iron Style puſh back the Nerves through the Perforations into the greater Concavity, from whence you may, by conveying a ſmall Hook into that Perforation through which the *Spinal Marrow* deſcends, either draw them out, or puſh them downwards through the lowermoſt Perforation.

The cleanſing of the Skull requires ſtill more Labour and Application; for on its *Baſis* it has divers Prominencies and Proceſſes, which in thoſe Places where they meet make ſeveral *Sinus's*, which are fill'd up either with Fleſh, or with Membranes, ſticking very cloſe to them. The numerous Perforations which are found in the Head, add alſo to the Difficulty of the Operation; and therefore the cleanſing of this Part of the Body muſt not be undertaken but by the Hands of an experienced and induſtrious Perſon, ſuch an one as is well verſed in *Oſteology*, or the Doctrine of the Bones: And he ought to make it his chief Buſineſs and Care not to tear or break any thing here, in reference eſpecially to the *Proceſſus Styliformes & Aliformes*, which are very thin. The *Styloides* being ſometimes alſo united only by a *Cartilage*, and therefore ſoon impaired, if you find them ſomewhat looſe, you muſt immediately take them out, and keep them, in order to put them in their Place again. Furthermore, the better to cleanſe the before-mention'd ſmall *Sinus's*, you muſt have at Hand a Pair of long and ſharp-pointed Twezers, wherewith you may take hold of and pull out the Membranes. The ſame Inſtrument may alſo ſtand you in good ſtead in cleanſing the *Meatus Auditorius*, and other Perforations or Paſſages, which will not admit of a Style within their Cavities; but thoſe that will, you may more conveniently cleanſe them either with the Style, or the Point of your Inciſion-Knife. Whilſt you are employed about the *Meatus Auditorius*, you muſt endeavour to bring forth from thence the Three ſmall Bones which belong to the Inſtruments of Hearing, which, according to *Columbus*, muſt be faſten'd and hang'd on the *Proceſſus Mammillaris*, or be preſerved otherwiſe.

Before I conclude this Chapter of the cleanſing of the Bones, I muſt alſo admoniſh you, that the Bones of the Body amounting to a conſiderable Number, and many of them reſembling ſo near to one another, that they are ſcarce to be well diſtinguiſh'd even by an experienc'd Anatomiſt, and that notwithſtanding this, each muſt be plac'd in their proper Poſition, it will be requiſite you ſhould tie them together with a Thread or String, in the ſame Order they are plac'd in the Body, which if you neglect to do, you may perhaps loſe more Time in gathering and ordering your Bones, than in putting them together. As for Inſtance: In the Hand begin with the Little Finger; firſt of all tie together the uppermoſt Joint, then the middle, and afterward the lowermoſt, together with the Bone of the *Metacarpus*, which lies under this Finger. Next to this Finger, do the ſame with the *Annular* Finger; then the Middle; after theſe, the *Index*; and laſt of all alſo the Thumb; faſtening them thus in due Order to the former String. In the ſame Manner you muſt proceed with the other Hand, and with the Feet likewiſe.

The Ribs being alſo many in Number, it will be requiſite you ſhould tie thoſe belonging to each Side ſeparately together, in the ſame Order as they are plac'd by Nature. And you muſt take the ſame Courſe likewiſe with the *Vertebræ*, eſpecially with thoſe of the Back, becauſe they are harder to be diſtinguiſh'd than moſt of the other Bones.

After you have well cleanſed the Bones, be ſure to take an exact Account of their Number, whether you have them all together or not, for fear you ſhould throw away ſome of them with the Water wherein they were boil'd before. Above all Things you muſt take care of the Teeth, becauſe they are very apt to drop out whilſt they are boiling; as likewiſe of theſe *Lamina* which being Part of the *Temporal Bone* adhe-

adhere to the Sides of the *Synciput*, and often fall off in the Boiling. *After having taken an exact Account of them all*, (ſays *Veſalius*) *it will be very neceſſary to dip the Bones once more in clean boiling Water, but ſoon take them out again, and rub them well with a rough Linen Cloth, in order to clean them of the Remnants of the Ligaments and Membranes, or of the Relicks of the Inſertions or Originations of the Muſcles.* But if you will follow my Advice, this ought not to be attempted in thoſe Bones which are of a tender Subſtance, for Reaſons given before.

And thus we have given you in this Chapter what relates to the Operation of Setting up a Skeleton, as far as it has a Relation to that Part which teaches us the Preparation of the Bones toward their ſucceeding Conjunction: But there are not a few now-a-days who not ſatisfied with what has been ſaid upon this Head, pretend to a further Purification of the Bones, by poliſhing and rendring them ſo exceſſive white and ſhining, as ſeems almoſt ſurpriſing to thoſe that ſee them. It would be no difficult Task for me to add divers Obſervations upon this Head; but ſince theſe Things were invented rather for Ornaments and Curioſities Sake, than any peculiar Uſe, and it being our Purpoſe in this Treatiſe to conſult rather the Benefit than the Curioſity of the Reader, (the laſt of which ought ſeldom to take Place in Anatomical Operations) I am rather inclined to keep cloſe to and within my Bounds, than to lanch out into ſuperfluous Digreſſions.

CHAP. II.

Of the Compoſition or Setting together of the Bones *after they have been cleanſed.*

THE Compoſition of the Bones, known by the Name of a *Skeleton*, is not only uſeful to young Students, in order to attain to the true Knowledge of the Bones, but affords alſo no ſmall Aſſiſtance even to the Profeſſors of Anatomy, when they are to ſhew to the Spectators the Inſertions of the Muſcles, before they come to the Bones, in the Diſſections of dead Bodies. 'Tis upon this Account that they have thought fit to preſerve in their Reſervatories theſe Heaps of Bones, *viz.* to make uſe of them upon ſuch-like Occaſions. But to ſave you the Trouble of gathering and laying up theſe diſorderly Collections of Bones, I am ready to put you in the right and beſt Way how to join and put together all theſe Bones, ſo as to erect a Skeleton in ſuch a Manner, that you may be able to take it to Pieces, and ſet it up again after you have made uſe of all the particular Parts that compoſe it, in a quarter of an Hour's Time.

But before you put your Hand to the Work, you muſt provide your ſelf with certain neceſſary Inſtruments, without which you cannot poſſibly perform the intended Operations. Among theſe the chiefeſt are, a *Terebra*, or Wimble, a Pair of Siſſers, a Pair of Twezers or Pincers, and Thread, or rather Wire.

Unto the Wimble I give ſometimes the Name of a Needle, or of a *Fibula* of Driller. Theſe muſt be of different Sizes, becauſe the Bones are not all of the ſame Bigneſs; ſo that the larger Bones require large Inſtruments, and the leſſer little ones, and thoſe of a middle Size ſuch as are ſuitable to them. Theſe laſt I call Drillers, or Piercers, the others Needles, and the firſt in general, Wimbles. You muſt alſo take Notice, that the Needles muſt not be too long, becauſe if they are ſo, they will be apt to break; but the Wimbles may be pretty long, being deſign'd for the Perforation of the thick and large Bones.

Beſides theſe Wimbles, you will ſtand in need alſo of another * Engine, which by turning the Wimble round after it is fixed into the Bones, promotes their Perforation.

When you intend to make uſe of this Engine, fix the Baſis thereof in ſome Place or other where you pleaſe, but take care that the Prominency of the Wood that turns about be in the open Air, that thus you may the better manage the Bones, and ſometimes ſtreightways, ſometimes obliquely, as you

[* *See the* Table *relating to this and ſome other* FIGURES *at the End of this Tract.*]

you ſhall ſee Occaſion, bring them to the *Terebra*, or Wimble, without any Hindrance. After you have fixed the *Baſis*, fix the *Terebra* alſo in its proper Place; and to faſten it the better, drive a Nail through it. Thus the Bow by drawing forward and backward will turn the *Terebra*, unto which you muſt hold the Bone very cloſe that is to be perforated.

After you have perforated the Bones, you muſt take care alſo of ſome Thread, wherewith to join the Bones together. Formerly they uſed to put them together by the Help of Fiddle-Strings; but theſe being of no long Continuance, as *Fabricius* well obſerves, he did make uſe of Braſs Wire inſtead thereof, being ſenſible, that the ſame would be of as long a Duration as leaſt as the Bones themſelves. Some have made uſe alſo of Iron Wire; but becauſe this laſt is apt to grow ruſty, the firſt is with good Reaſon preferable to the other, as being not ſo apt to be ruſty. But before you make uſe of this alſo, you muſt put it into the Fire, for without it, it will be brittle, and apt to break if you twiſt it very cloſe. Whilſt it is heating in the Fire, it will contract ſome Impurities: Theſe you muſt take off with ſome Brick-Duſt and Oil, which will make them look the better. *Columbus* ſays we muſt boil the Braſs Wire, which will make it ſufficiently flexible. Then cut off a Piece of your Braſs Wire with the Siſſers, of ſuch a Length as you think fit, and putting it through the Perforations in the Bone, draw it toward you, and bend it round and cloſe by the Help of a Pair of longiſh and round Pincers, to prevent its coming out again.

This is the general Method of putting together the Bones: But for fear this ſhould not be ſufficient, I will now proceed to ſome more particular Rules, and ſhew not only in what Places the Bones are to be perforated, in order to inſert the Wire with the more Conveniency, but alſo in what Places there is any conſiderable Difference betwixt this intended Compoſition of the Bones.

The before-mention'd *Wilhelmus Fabricius* has attempted ſomething of this Nature, and written a Letter relating to theſe Operations, to Mr. *Pavius*, which is annexed to his Treatiſe written in the *German* Tongue, treating of the *Excellency* and *Uſefulneſs* of *Anatomy*, which if you do think fit to peruſe, you will meet there with many uſeful Obſervations; but there being ſtill many Things wanting, I will now endeavour, as much as in me lies, to ſupply this Defect.

Make therefore your Beginning with the Limbs, but eſpecially the Hand; after which you muſt come to the Foot: And laſt of all I will ſhew you alſo how to ſet together the Trunk of the humane Body.

In the Hand you muſt begin at the laſt Joints of the Fingers; and therefore make Two Perforations in the Inſide of the Third Joint, near the Articulation, with your *Needle*, ſo that the *Needle* paſſes quite through it in one Place only, as ſome will have it who make but one Perforation in the ſubſequent Bones, or elſe ſo as to make your Perforations quite through the Bones in Two Places, as *Fabricius* does it, who makes Two Perforations in each of the Bones of the *Phalanxes* of the Fingers, and of the *Metacarpus*, to prevent their turning round, which indeed is a very uſeful, but at the ſame time exceeding troubleſom and difficult Piece of Work. But whatever it be, whether you make one ſingle or Two Perforations in each Bone, you muſt take care ſo to manage the Matter, that the Hole of the uppermoſt Bone be directly correſpondent to that of the undermoſt; and therefore take this for a general Rule, that you make thoſe Holes through which you are to put the Wire as much as poſſibly can be paralleſ and directly oppoſite to one another. Then place the Bones in the ſame Poſition they are to be put in hereafter, and then, if it be a ſmall Bone, endeavour with a ſharp-pointed Needle to mark exactly the Place where the intended Perforation is to be made; but if you cannot make any Impreſſion on them with the *Needle*, you muſt gently pull the Bones aſunder, and take a Mark by your Eye-ſight in what Place the Wimble is to be fixed; and this Obſervation takes Place in all the Bones belonging to the Hands and Feet. If you have made Two Perforations in each of the Bones, you muſt convey alſo Two Ends of the Wire through them, and twiſt them together under the *Metacarpus*: But if you intend to perforate but once ſome Joints of the

the Fingers and the *Metacarpus* and *Metapedium*, you muſt perform that with the *Fibula*, becauſe you muſt draw a double twiſted Wire through the Holes. You muſt alſo make Two tranſverſe Perforations in the ſuperior Parts of the *Metacarpus*, towards the Palm of the Hand: This you muſt do with your Needle, and then draw through the Wire, as has been ſaid of the Fingers, and join them together, but not too cloſe, becauſe they are not very cloſely join'd in living Bodies. According to the Directions given us by *Columbus*, the Conjunction of the Bones of the *Carpus* with the *Metacarpus* is not very difficult; for when he cleanſes the Bones, he does not meddle with the Ligaments belonging to the laſt, to ſave himſelf the Labour and Trouble of gathering and uniting them together again; and the ſame Method he takes with the Bones of the Foot. 'Tis certain, 'tis a very tedious Piece of Work to bring all thoſe Bones again into their natural Poſition, and not ſo much as to be attempted without you have another Skeleton for a Pattern before you, which may ſhew you the true Station of all theſe Bones; it being impoſſible to give an exact *Idia* of them in Writing, becauſe theſe Bones are deſtitute of their proper and peculiar Names. Nevertheleſs I will try at it, and venture upon ſomething of a Deſcription, to ſhew you in what Order they muſt be placed, by impoſing upon them certain Names, taken from their ſeveral Forms and Figures.

Under the Thumb lies the *Os Cubiforme*, or like a *Cubus*, but with very unequal Sides, and therefore might rather be call'd *Trapezoides*. Under the fore Finger lies the *Trapezius*. The Middle Finger has for its Foundation the largeſt and thickeſt Bone of the whole *Carpus*, having a ſmall Head on its hindermoſt Part. Unto the *Annular* and little Finger is ſubjacent the *Os Unciforme*, or like a Hook, becauſe it is bent like a Hook on the Inſide of the Hand: And adjacent to this, on the Outſide, is another ſmall one, the Sides whereof conſtitute Four Triangles. You might call it the *Cuneiforme*. And next to this is another leſſer Bone, about the Bigneſs of a Pea, but a little flat on that Side that is next to the other. Theſe Bones you muſt join together in the ſame Order as they have been ſet down here: To do which, you muſt make Two Perforations in each of them with your Needle, and draw the Wire through in the ſame Manner as you did before through the Heads of the *Metacarpus*; but they muſt not be joined together in a ſtreight Line, but rather obliquely, and ſomewhat bent like a Bow. Two Bones more are ſtill behind, unto one of which I will give the Name of the *Os Katyloides*, by reaſon of its Convexity or *Sinus*, wherein the ſmall Head of the before-mention'd biggeſt Bone is inſerted: The other I call the *Lunatus*, from its *ſemilunar Sinus*. After you have well obſerved the true Poſition of theſe Bones, you muſt make your Perforations with the *Fibula*, in thoſe Places which are correſpondent to the Bones of the *Metacarpus*, and then draw your Wire through the Fingers, and likewiſe through the Thumb. Here *Fabricius* twiſts or turns his Wire, and joins the Hand to the *Cubitus* and *Radius* by the Help of other Wires: But I judge it more convenient to draw the ſame Wires that have been inſerted into the Thumb, Fore-Finger, and Middle-Finger, through the *Radius* alſo, and only to twiſt or turn the reſt together.

In the ſame Manner you muſt perform the Conjunction of the *Cubitus* and *Radius*, both on the upper and under Part, with this Difference only, that the uppermoſt Holes of the *Radius* muſt be altogether the ſame with thoſe you make on the lowermoſt Part of the *Cubitus*; and the ſame Rule muſt be obſerved in reſpect of the inferior Part of the *Radius* to the ſuperior of the *Cubitus*. You muſt now inveſtigate exactly their natural Poſition; and next to that, take Notice in the upper Part of the *Radius*, of a certain Place which ſeems to be more plain than the reſt. Near this fix your Needle, and let it paſs through the ſame Hole which was made before for the drawing out of the Fat out of that Bone. In the *Cubitus* you muſt perforate with the *Fibula* the *Demilunar Sinus* in the Middle all at once: Then turn or twiſt your double Wire in ſuch a Manner, as to make a Kind of a Ring on the upper Part, (in the ſame Manner as ſhall be ſhewn hereafter concerning the *Scapula*). This muſt be convey'd

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through the perforated *Cubitus*, and faſten'd by twiſting it together. Then you muſt draw another Wire through one of the ſmall Holes of the *Radius*, and having convey'd it through the before-mention'd Ring of Wire, paſs it through the other ſmall Hole of the *Radius*, and let both their Extremities be twiſted together. On the lowermoſt Part you muſt proceed in the ſame Manner in the Compoſition of theſe Bones, with this Difference only, that what has been ſaid there of the *Cubitus*, muſt here be applied as if ſpoken of the *Radius*; and ſo on the other Hand.

To join the *Cubitus* to the *Humerus*, you muſt perforate both its Heads or Protuberancies; and if you are quick-ſighted enough to diſtinguiſh from the reſt that Place or Line, which appearing ſomewhat clearer than the reſt, divides as it were this *Sinus* into Two Parts, you may make your Perforations parallel with this Prominency. Neither is it any great Matter if you ſpoil the Surface of this Line, it being inviſible after its Conjunction. This Operation is not to be performed without ſome Difficulty, becauſe the *Sinus* is of a *Demilunar* Figure, and therefore the Bone ought to be perforated in the ſame Manner, which cannot be done, becauſe the *Terebra* will penetrate in a ſtreight Line through the Bones: But to incurvate in ſome meaſure this Paſſage, you muſt make your Perforation at both Extremities; ſo that theſe Holes meeting one another, make an obtuſe Angle. This done, make another Perforation in the Middle of the *Humerus*, a little above the *Trochlea*, and then drawing your Wire through this and the beforeſaid Holes, twiſt it together, not too cloſe, but only looſe, for elſe it would hinder the bending of the Elbow.

You muſt not begin to perforate the Head of the *Humerus* before you have joined the *Scapula* to the Ribs: You muſt therefore perforate the Glenoid Cavity in the Neck of the *Omoplata*, ſo as to open a Paſſage to the Inſide, through which you may convey a twiſted Wire, and then turn it together.

That you may know in what Place you ought to perforate the Head of the *Humerus*, put the *Humerus* cloſe to the *Omoplata*, in the ſame natural Poſition as you find it in the Body, and then you muſt take exact Notice of the Place where it touches that where the Wire is inſerted in the Neck of the *Scapula*: Here you muſt make your Perforation with the *Fibula*, which muſt terminate in the *Sinus* which is made for the Reception of one of the Tendons of the *Biceps*. You muſt draw a pretty thick Wire through this Hole, which muſt be twiſted on the other End like a ſpiral Winding: This you muſt faſten to the Ring, adapted to the *Cervix* of the *Scapula*, which will perform the ſame Motions as are to be obſerved in the Shoulder of a living Body.

The Compoſition of the Foot, properly ſo call'd, is very near the ſame with that of the Hand, ſome few Things excepted, which muſt be remember'd here in a few Words. The Great Toe is to be join'd in the ſame Manner as the other Fingers and Toes. There are beſides theſe many other Bones in the Foot, call'd the *Seſamoidea*, among which, thoſe that are placed under the Great Toe are worthy our peculiar Obſervation, they being pretty large, and therefore to be put in their proper Places, becauſe they are always extant, which is not the ſame with the other Bones here. There are Two *Sinus*'s or Cavities in the Head of the Bone of the *Metatarſus*, being diſtinguiſh'd from each other in the Middle by a certain ſmall Protuberancy. This you muſt perforate tranſverſedly with your Needle, and ſo you muſt do with the *Oſſa Seſamoidea*, and then join them together with Wires.

As to what concerns the Compoſition of the Bones of the *Tarſus*, the *Cuboides* is plac'd at the End of the little and next adjoining Toes; and this reaches again to the *Calcaneum*. Through theſe you muſt draw the Wires of the beforeſaid Bones, and faſten them in that hollow Part which is made by the *Talus* and *Calx*. Next unto this is the *Cuneiforme Medium*, which lies under the middle Toe, unto which is adjacent the *Cuneiforme Minus*; quite otherwiſe than what has been obſerved by *Spigelius*, who aſſigns the middlemoſt Place to the *Cuneiforme Medium*. Theſe Three Bones appear on the fore Part parallel to one another; but the Fourth, or the *Cuneiforme Majus*, is prominent before the reſt. The Bones call'd the *Cuneiformia* are plac'd near the conve-

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Part of the *Os Naviculare*, the convex Part whereof is oppoſite to the *Talus*: And here are join'd the Bones of the Three Toes, the Wires whereof muſt be twiſted together.

But before you do this, the *Oſſa Cuneiformia* and the *Cubiforme* muſt be join'd together firſt, which muſt be effected by drawing a Wire through them tranſverſedly, in the ſame Manner as has been ſhewn before in the *Carpus* of the Hand.

When you are to join the *Aſtralagus* with the *Calcaneum*, you muſt perforate it twice in that Cavity or *Sinus* where the fore Part of the *Tibia* touches it, and make your Perforation through the *Calx*, underneath which you muſt twiſt your Wires together. Some make a tranſverſe Perforation through both theſe Bones, and convey the Wire through them.

The Foot may be join'd to the *Tibia* and *Fibula*, if you perforate the *Talus* and both the *Malleoli* with a pretty thick Wimble, and then put a Nail through them. I call in this Place a Nail a thick Braſs Wire, ſuch as will not eaſily bend, being deſign'd and adapted exactly to the Holes made by the aforeſaid large Wimble.

If you intend to join the *Femur* to the *Tibia*, make Two Perforations near the Sides of that Hole which was made for the taking out of the Marrow, one whereof muſt terminate at the *Perone*. You muſt twiſt your Wire in the ſame Manner as has been ſaid before concerning the *Scapula*, ſo as to make a Ring or Circle. Draw the Two Ends through the Holes, and one of them ſo through the *Perone*, which by ſo doing it will faſten to the *Tibia*.

The *Patella* has a longiſh *Protuberancy* like a Line on the Inſide, on each Side of which you muſt make a Perforation, ſo that they meet one another in an obtuſe Angle: Convey your Wire through them, and twiſt it together, and then make another Perforation in the Protuberancy of the *Tibia*, placed in the Middle of the Head of the *Tibia*: Through this you muſt draw the other End of the Wire. You muſt make your Perforation in the *Proceſſus* of the lower and back Part of the Head of the *Femur* with a thick Wimble, that you may drive a Nail through it, which muſt paſs by the Angle of the *Patella* inſerted into the *Tibia*, and ſo join both the Bones together. *Fabricius* has another Way of joining theſe Bones together, as alſo with the *Patella*, which you may ſee in his Letter to *Pavius*, and is very proper to prevent the Slipping of the *Tibia* on either Side. *Veſalius* puts a Stick or Piece of Wood into the ſame Holes that were made for the taking out of the Fat, and thus faſtens theſe Two Bones together.

Whenever you propoſe to join the *Femur* with the *Coxendix*, you muſt be very careful to make your Perforations ſo as to be parallel to one another, for fear the Foot ſhould bend inwards beyond its due Poſition: You muſt therefore fit the *Femur* to the *Acetabulum*, ſo as to fix it in its natural Poſition; which done, you muſt perforate both theſe Bones with a pretty large Wimble; and if you drive a Nail through them, it will keep the Bones together.

Before I go any further, becauſe I have had Occaſion to mention the *Coxendix*, I will here add its Connexion. This Conjunction is made either on the fore Part with its Fellow, or backwards with the *Os Sacrum*.

Becauſe this is a very broad Bone, it muſt be join'd twice to the *Os Sacrum*, *viz.* to its Firſt and Third *Vertebræ*. If you can get a Wimble of ſuch a Length as to reach through the *Os Sacrum* to that of the *Coxendix*, which is oppoſite to it, you may join theſe Two Bones together with the ſame Wires, which is actually the moſt convenient Way, and hides the Wires beſt: But for want of ſuch a one, you muſt lay both theſe Bones cloſe together, and then perforate them at once, *viz.* twice on the upper Part near the Firſt *Vertebra* of the *Os Sacrum*, and twice again near the Third, and then faſten them cloſe together with your Wires. To join it to its *Fellow*, you muſt make Two Holes in each of them, beginning at the Place where the Cartilage unites the *Oſſa Pubis*, which is now not here, and ending in the interior Region: And take care to make your Perforations ſo, that the Holes may be directly oppoſite to one another. The Ends of the Wires muſt be drawn through one of the Bones from the Inſide, and through the other from the Outſide, and then be twiſted together as is uſual to keep them together.

The *Coccyx* is coherent to the lowermoſt *Vertebra* of the *Os Sacrum*. It is compoſed ſometimes of Three, ſometimes of Four Bones: Each of theſe muſt be twice perforated with a Needle; and ſo you muſt do likewiſe with the laſt *Vertebra* of the *Os Sacrum*. After this take one ſingle Wire, and put both the Ends through all the Bones of the *Coccyx* in due Order: And laſtly alſo through the *Os Sacrum*, and then twiſt them together.

I am now come to the *Vertebræ*; concerning the Conjunction of which, not the leaſt Mention has been made by any of thoſe Authors that have written any Thing of the Compoſition of a Skeleton: The Reaſon is, becauſe they thought it ſufficient for their preſent Purpoſe to ſet the Skeleton upright, by putting an Iron Rod through the Perforation of the *Spinal Marrow*: But conſidering with my ſelf, that this Invention does not anſwer the neceſſary End, becauſe I found the *Vertebræ* not to ſtick cloſe, but to turn round, (though *Fabricius*, to remedy in ſome meaſure this Inconveniency, has put Wooden Pegs, or ſmall Pieces of Wood, round the Iron Rod) I have contrived a peculiar Way of joining together and faſtening theſe *Vertebræ*, and diſliking the Vulgar of attaining this End, by putting the Wires croſs or ſideways through them, becauſe it covers the whole Body of the *Spine* like an Armour, I have pitch'd upon the following Method, *viz.* I perforate twice the Bodies of the *Vertebræ*, ſo that theſe Perforations deſcend through them in a ſtreight and parallel Line. I begin at the Second *Vertebra*, becauſe the Firſt I faſten to the Head, making my Firſt Perforation with a large Wimble on the Sides of the Teeth. Then I proceed in the ſame Manner with the next, and ſo with the reſt, till I have join'd together with one Wire only all the *Vertebræ* that belong to the Neck and the *Thorax*; for you muſt obſerve, that I unite the *Vertebræ* of the Loins with the *Os Sacrum*, becauſe in caſe there be any Occaſion to take the Skeleton in pieces, it is eaſier done this way: The Ends of the Wires being of that Thickneſs, that they cannot be twiſted together, I only turn and bend them. To the Head you muſt join the *Atlas*, which muſt be perforated on the hinder-moſt Part, near that Perforation through which deſcends the *Vena Cervicalis*, as alſo the *Epiphyſis* of the *Occiput*, which is united with the *Sinus* of the *Atlas*. You muſt convey the Wire through that ſmall Hole, and draw its End through the great Perforation of the *Occiput* to the Head, where you muſt twiſt both Ends together.

The next that follow of Courſe are the Ribs, which muſt be faſten'd to the *Vertebræ* and to the *Sternum*. Theſe *Fabricius* does not ſeparate from the *Spondyli*, but for what Reaſon I am not able to tell, becauſe he afterwards joins them nevertheleſs together with a Braſs Wire. There is but one and the ſame Way required in the Compoſition of all the Ribs; ſo that if you know how to manage one, you know how to deal with all the reſt; which you muſt perform thus: Adapt or fit the Firſt Rib (for here you muſt make your Beginning) to the *Vertebra*, and obſerve very well with your Eye the exact Place where they meet; which done, you muſt there make Two Perforations with the *Fibula*, through the Rib: Then fit your Rib again to the *Vertebra*, and conveying your Needle through theſe Holes made in the Ribs, perforate alſo the *tranſverſe Proceſſes*, and after having widened the Perforation with the *Fibula*, join the Rib and *Vertebra* together by the Help of a Braſs Wire: This done, you muſt immediately alſo faſten the Rib on the oppoſite Side to its *Vertebra*: Then join the Second *Vertebra* to the preceding, and proceed in the ſame Manner with all the reſt, *viz.* the Third, Fourth, and all the other Ribs.

The Cartilages of the *Sternum* being ſeparated before, and the fore Part of the *Thorax* from the Ribs, properly ſo call'd, and ſome of the ſpurious Ribs, they muſt now be reunited again. Their Conjunction is the ſame, in reſpect to every one of them; and with this alſo agrees that Compoſition which joins the *Claviculæ* with the *Sternum* and the *Omoplatæ*. This may be performed by Two different Ways, either by conveying one ſingle Wire through them, or the ſame Wire at twice. The laſt of theſe Two Ways is the ſame with that made uſe of in the Connexion of the Bones of the *Pubis*, which how it is to be done, is ſhewn already. But if you are for drawing through

your Wire but once, make only one Perforation in the Rib, and another parallel with the former in the *Cartilage*; and after you have drawn your Wire through them, twiſt it together in the Concavity of the *Thorax*: But which Way ſoever you think fit to chooſe of theſe Two, it will be requiſite you ſhould perforate the Ribs before you faſten them to the *Vertebræ*, for elſe you will find it a difficult Piece of Work. When you are to fit the *Sternum* to the Ribs, it muſt not be too dry: If it happens to be ſo, you may dip it in Water, which will make it ſwell, and reduce it again to its natural Form and Bulk. Whilſt it is drying, you muſt by Degrees draw the Strings together: Unto which it will be requiſite you ſhould alſo add ſome ſmall Sticks; as has been ſhewn before.

You muſt place the *Scapula* in its true Poſition to the Ribs, and then mark the exact Place of the Three *Vertebræ*, *viz.* of the Second, the Fourth, and the Sixth, on both Sides, and then perforate them with the *Fibula*. Firſt join the *Clavicula* to the *Sternum*, and then alſo to the *Omoplata*, which you muſt laſt of all faſten to the *Vertebræ*.

To keep the Ribs at a due Diſtance, it will be requiſite to encloſe their Sides with Braſs Wires: Therefore perforate the Firſt Rib before it is faſten'd to the Skeleton; ſo that the Hole be at Two Inches Diſtance from the *Sternum*. After you have drawn your Wire through this, you muſt twiſt it together to ſuch a Length, as is anſwerable to the natural Interſtice or Diſtance betwixt this and the Second Rib: Then encloſe or ſurround the Second Rib within the ſame Wire; and after you have twiſted it together in the ſame Manner as before, repeat the ſame with the Third, and ſo one after another till you come to the Twelfth Rib, which muſt be perforated near its Extremity, through which Hole you may draw the Wire, and afterward twiſt it together, to render the whole Frame the more firm and ſtable.

We are now at laſt come to the Head, which is not actually join'd to but only ſet upon the upper Part of the Skeleton; for which Purpoſe you muſt make a very large Perforation with a very thick Wimble in the *Vertex*, ſo as to be directly oppoſite or upon the ſame ſtreight Line with the Hole of the *Occiput*. It muſt be ſo big as to admit the Point of a Little Finger, becauſe through it muſt go an Iron Bar or Rod, which ſupports the whole Skeleton. To the *Baſis* of the Head you muſt alſo faſten its *Vertex*, which was removed in the Opening of the *Calvaria*, or Skull; and therefore you muſt make Two Perforations on the Backſide of each of them, ſo that two of them are directly oppoſite to each other in a ſtreight Line. Through theſe you muſt draw alſo Two Wires, which muſt be twiſted together within the Concavity of the *Calvaria*, but not very ſtreight, that it may be opened and ſhut again at Pleaſure. In the fore Part make a Perforation betwixt the *Criſta* and the exterior *Lamina*. Put a Style into it, which muſt be ſo long as to reach to and enter the Hole, that muſt be made directly againſt it in the *Vertex*. Laſt of all you muſt alſo unite with the reſt the inferior *Maxilla*; this being the Concluſion of the whole Operation. You muſt perforate its Proceſs call'd κονδυλώδης, which is pretty thick, and then after you have fitted or adapted it to the Head, take Notice what Place it is that is next to this Perforation, as well before as behind, in the *Cranium*: Here make your Perforation, ſo that the *Fibula*, may penetrate within the Concavity of the *Cranium*: Then convey the Wire through the Jaw-Bone, and draw both its Ends through the beforeſaid Two Holes within the Head, where you muſt twiſt them together.

But ſince (as *Veſalius* well obſerves) this Conjunction is not ſo very firmly done, as to keep both the Rows of Teeth together, becauſe the Lower Jaw-Bone will be ſomewhat hanging downwards; and it being look'd upon as a ſingular Piece of Nicety, that the ſame ſhould be contrived ſo, as to be moveable, ſo that it may be drawn up toward the upper Row, and pull'd backward again at Pleaſure. To effect this, you muſt, beſides the beforeſaid Operation, perforate the *Coronæ* of the *Proceſſus Inferior Acutus*, and faſten a String to it, which paſſing under the *Oſſa Jugalia*, and over the Bones and the *Vertex*, may ſometimes be drawn toward the Front, ſometimes toward the *Occipitium*, and conſequently make one

Row of Teeth touch the other as you think fit.

Thus you ſee all the Bones belonging to a Skeleton join'd and put together. There are nevertheleſs ſtill remaining ſome other ſmall Bones, ſuch as thoſe that are the Inſtruments of Hearing, and the *Os Hyoides*, which, as they are not immediately contiguous to the reſt of the Bones, they are for that Reaſon rarely added to it. *Fabricius* nevertheleſs puts theſe Three Bones belonging to the Ear in their natural Poſition, and then encloſing them in a Flint Glaſs, hangs it it on the *Proceſſus Mamillaris*.

But becauſe the Bones do by their Weight naturally tend toward the Ground, you muſt take care to prop up your Skeleton with ſome Iron Bars: To effect which, I think Two round Props ſufficient, one of them to deſcend through the Concavity of the *Spina*, and the other to be faſten'd below, ſo as to be fix'd with its Point under the *Vertebræ* of the Loins.

If therefore you are reſolved to ſet up a Skeleton, you muſt provide your ſelf with a long wooden Cheſt or Repoſitory, to keep the Skeleton from being ſpoiled and defaced by the Air and Duſt. Then firſt of all fix one of the Iron Bars or Props at the Bottom of the Cheſt; and to keep it ſteady and upright, faſten it with ſomething on both Sides: After which you muſt inſert it betwixt the *Os Sacrum* and the Fifth *Vertebra* of the Loins. The other muſt be conveyed from the upper Part downward; and then both theſe Props to be faſten'd together by Means of Pegs or Nails. After this put on the Head and the *Cochlea*, join the ſeveral Parts belonging to the Leg to the Trunk with Nails, and afterward the Arms near the *Scapulæ*.

By Way of Appendix, I will (according to my Promiſe) ſubjoin here in a few Words the *Skelotopœia* of a new-born Infant.

You muſt not take aſunder the Trunk of the Body, but only take off the Head, which you muſt clear of the Brain. To do this, you muſt put a Style through the great Perforation of the Bone of the *Occiput*, and ſtir it about on all Sides, till the Brain, which is very ſoft, be diſſolved and brought out of the Head; and that you may be ſure that nothing of it is left behind, waſh the Inſide of the Skull ſeveral times with Water. After the ſame Manner you muſt proceed with the *Spinal Marrow*, which you muſt thruſt out with a Style through its lower Part. The Body it ſelf muſt be cleanſed much after the ſame Method as has been ſhewn before in the *Sternum*. The Fleſh muſt be cut off of the tender Bones, and the Membranes alſo taken off; but this you muſt perform with the utmoſt Application and Circumſpection, for fear of impairing their Subſtance, or to cut off the Ligaments and Cartilages, which would make the Bones fall aſunder. Neither muſt the *Sternum* be ſeparated from the Ribs: But as to the Legs and Arms, you may take them from the Trunk, if you pleaſe, becauſe they may eaſily be put on again without any remarkable Deformity.

Some I know have a Way of dipping theſe Bones frequently in Water whilſt they are cleanſing: Nay, *Columbus* alſo boils them; for ſays he, *If you intend to prepare the Bones of a Child*, (for a Skeleton) *take Care you do not boil them too long, becauſe their* Appendices *are eaſily relaxed.* According to my Method, I never boil them, but only macerate them for Three Days in cold Water, which I change ſeveral Times, which ſoftens the Fleſh, and renders it ſo pliable, that it is taken off without any Difficulty or Trouble. By the ſame Method you may alſo make up the Skeletons of leſſer Creatures, the Bones whereof are ſo ſmall, that you cannot put a Needle, or Driller, through them; ſuch as the Mice, Rats, Squirrels, and ſuch-like other Creatures that are of a very ſmall Size; as likewiſe the leſſer Sorts of Birds, for the Bones of the larger Birds and Beaſts may be join'd together by Means of Wires.

CORROLLARIUM.

I cannot upon this Occaſion forbear to add (by Way of a *Corrollarium*) another Method of preparing Skeletons, in Two Words, which as it is performed with the utmoſt Eaſe, and without the leaſt Trouble ſoit owes its Firſt Invention to Chance only.

Put the Creature out of which you intend to make your Skeleton in a Veſſel, a

put it during the Summer Seaſon in a warm and moiſt Place, till it goes into a Putrefaction. This Putrefaction will produce divers Sorts of Worms, of a peculiar Kind, which will feed upon the Fleſh till all of it is conſumed, and the Bones be left quite bare. Dr. *Thomas Bartholin*, whom I ought to reverence for ever as my worthy Inſtructor in Anatomy, has in his *Muſæum* a Skeleton of a Water-Snake, prepared after this Method.

Or elſe put your little Creature under the Rafters on the Top of the Houſe during the Summer Seaſon, where it will likewiſe breed vaſt Numbers of Worms, which will conſume not only all the Fleſh, but alſo the very Feathers, ſo as not to leave the leaſt of either of theſe Two behind them.

Let this ſuffice for this Time, concerning what I propoſed to my ſelf in relation to the Rules and Method of preparing a Skeleton. I hope the candid Reader will be pleaſed to accept and make uſe of the ſame, till ſome greater Genius or other ſhall think fit to oblige the Publick with ſomething that is better and more perfect in this Kind; and judge of my good Intentions, by what I was capable of offering at this Time, in order to lead the young Students into the beſt and ſafeſt Way to perform ſuch-like Operations, with the leaſt Trouble and Labour that could well be expected in a Thing of this Nature.

An Explanation of the FIGURES relating to the SKELETOPOEIA.

N° I. *repreſents the* Terebra, *or Wimble.*

N° II. *The* Radula, *or Scraper, or Scratcher.*

N° III. *The* Terebra, *fix'd into an Engine, for the more commodious Perforation of the Bones.*

a. The Baſis of the Engine, which is faſten'd to ſome certain Places, with Nails driven through the Holes *b*, *b*.

c. The moveable Piece of Wood, which has a four-ſquare Hole at its anterior Part, *d.* into which the *Terebra*, *f.* is to be fix'd, *f.*

e. The Bow, with a Cord, which turns the moveable Piece of Wood.

Of PHLEBOTOMY. *Taken out of the Eighth Demonſtration of Monſieur* Dionis's *Courſe of Chirurgical Operations*, &c.

PHLEBOTOMY is without all Diſpute the moſt univerſal and moſt efficacious Remedy belonging to Phyſick; it being certain, that nothing that has been invented hitherto in our Art can ſtand in Competition with it.

What I am going to aſſert will perhaps ſeem ſurprizing to thoſe who look upon the Operation of Phlebotomy as the eaſieſt that can be performed. I am willing to agree with them thus far, that the Operation is very eaſie, when a Chirurgeon happens to meet with large Veins to be opened; but at the ſame Time they will alſo, I hope, agree with me, and all other Chirurgeons that are old and able Practiſers in our Art, in this Point, That they oftentimes meet with certain Arms, where the Veins are ſo very

very ſmall, that it is next to an Impoſſibility to find them out, and conſequently it is very hazardous to venture upon the opening of them.

By the joint Conſent of all experienc'd Chirurgeons, there is not any one Operation in our Art, though never ſo difficult and hazardous to outward Appearance, which they would not rather undertake, than venture upon the Opening of certain Veins; where, after having ſearch'd and examined them for a conſiderable Time, and taken all poſſible and neceſſary Precautions to draw Blood from them, after all, the Vein will ſlip away from under the very Point of the Lancet.

To adminiſter a *blank* Plebotomy is none of the greateſt Misfortunes in this Caſe; (for ſo they ſtyle it when no Blood comes forth;) but the greateſt Danger is from the opening of an Artery, or the pricking of a Tendon. Whenever ſuch a Miſchance happens, all the Blame is laid immediately upon the Chirurgeon, without making the leaſt Reflexion what inſurmountable Difficulties they meet with ſometimes in certain Subjects to perform this Operation.

Perhaps I ſhall be blamed for repreſenting Phlebotomy in ſo frightful a Shape, both to the Patient and young Chirurgeons; but I could not paſs by in Silence this Head, it being abſolutely neceſſary to cure young Beginners of this vulgar Notion, *viz.* that nothing is eaſier than letting of Blood, that they may not out of an Over-confidence venture without Diſtinction upon every Thing that offers it ſelf, but to examine with Diſcretion and with a previous Caution all the Circumſtances that attend it, to avoid the pernicious Conſequences that may ariſe from ſuch indiſcreet Management of it.

By the Word *Bleeding*, in a general Senſe, is underſtood any Flux of Blood out of any of the Veſſels. The *Greeks* have expreſſed it by the Word *Angiotomie*, which is deriv'd from *Angion*, ſignifying a Veſſel, and from the Word *Temnein*, *i. e. Secare*, or to cut: When Blood is drawn from an Artery, they call it *Arteriotomy*, and when a Vein, they expreſs it by the Word *Phlebotomy*, which has taken its Derivation from *Phlebs*, which ſignifies a Vein, and from *Temnein*, *i. e. Secare*. This laſt is to be the Subject of our Firſt Diſcourſe.

Phlebotomy is an Opening of a Vein, made by the Means of a Lancet, to draw Blood from it, leſs or more, according to the Condition of the Subject, and the End for which it is adminiſtred.

This Operation bears the ſame Date with the Firſt Riſe of Phyſick, and was practiſed even before *Hippocrates*'s Time. We ſee that this great Man was not only well acquainted with its Uſefulneſs, becauſe he adviſes us not only to make uſe of it as a moſt Sovereign Remedy in many Diſtempers, but alſo declares, that he himſelf has frequently adminiſtred it with extraordinary Succeſs.

In thoſe Days the Phyſicians put their own Hands to the Plough (as the Saying is): Phyſick and Chirurgery were then practiſed by the ſame Perſons. But ſince that Time the Caſe is alter'd in this Reſpect, the Practice of Phyſick and Chirurgery being of late Years Two diſtinct Profeſſions; for the Phyſicians have thought fit to reſt ſatisfied with the ſcientifick and theoretical Part for their Share, leaving the manual Operations to the Chirurgeons.

In *Hippocrates*'s Time, Bleeding was not adminiſtred ſo often as it is of late Years; but at the ſame Time they took away more Blood than we do now: For the Ancients meaſured the Blood they took away by Pounds; we only by Ounces, or ſmall Meaſures. They let Blood till the Patient did fall into a Swoon; but then they ſeldom bled him above once or twice. 'Tis true, we adminiſter Phlebotomy more frequently; but Twelve of ours do not take away ſo much Blood as Two of theirs.

'Tis this that makes good *Hipporates*'s Saying, That if you bleed a Big-bellied Woman, an Abortion will enſue; for he ſpeaks of the Phlebotomies of his Time, when they uſed to take away Two or Three Pounds of Blood at once, and not of thoſe of ours, when made in a moderate Quantity, which are ſo far from proving noxious to Women with Child, that they prevent and ſecure them againſt Abortion.

It would be an almoſt endleſs Piece of Work to enter upon a particular Account of all the Diſeaſes where Phlebotomy is uſeful and neceſſary, as well in relation to Phyſick

Phyſick as Chirurgery, there being very few which do not require it; though at this Time I propoſe to confine my ſelf only to thoſe that have a Dependance on Chirurgery, leaving the reſt to the Judgment of the Phyſicians; for there is a great deal of Reaſon to affirm, That in thoſe Places where no Phyſicians are to be had, a Chirurgeon ought or may ſupply his Place, and therefore he ought not to be ignorant of thoſe Occaſions where Phlebotomy may be uſeful; and even in thoſe Places where Phyſicians are to be had, the Occaſion may be ſo urgent, as that ſeaſonable Bleeding may ſave the Patient's Life: So that upon that Account alſo a Chirurgeon ought to have ſome Knowledge of that Branch of Phyſick, in order to enable himſelf to proceed according to its Rules.

However it is not our Intention to inſiſt upon this Point at preſent, as being beyond our Sphere, and therefore will limit our Directions in ſuch a Manner, as if they were to be put in Practice in ſuch Places as are provided with Phyſicians, being willing to allow, that a Chirurgeon in many Deſeaſes is no more than the Miniſter or Operator of what is preſcribed by the Phyſicians.

Apoſtumes, Wounds, Ulcers, Fractures, and Luxations, being all ſuch Diſeaſes as depend on the Art of Chirurgery, and where a Chirurgeon is always call'd before a Phyſician, are not to be cured without Bleeding, it being ſo abſolutely neceſſary, that to neglect it would be to render the Cure impracticable, and to hazard the Patient's Life; and therefore it will be requiſite to convince you in a few Words, of its Neceſſity in thoſe Caſes.

By the Word *Apoſtume* is underſtood every Sort of Tumour *contra Naturam*, of which there are Four principal *Species*, *viz.* the *Phlegmon*, which owes its Cauſe to the Blood; the *Eryſipelas*, which ariſes from the Bile; the *Oedema*, which proceeds from the *Pituita*; and the *Scirrhus*, which has its Riſe from a melancholy Humour.

All theſe Tumours owe their Origin, according to the Ancients, to an Over-plenty of Humours which fall upon the Parts; ſo that there being a Neceſſity for an Inanition of the Veſſels, to prevent the affected Part from being quite over-charged with them, there is nothing that is able to anſwer this End more effectually than *Venæſection*.

In all Sorts of Wounds there is an indiſpenſable Neceſſity for Bleeding, but more eſpecially in thoſe of the Head and of the *Thorax*. In caſe ſome ſmall Vein opens it ſelf either in the Brain, or in ſome other Part of the Body, the Blood will not ceaſe to iſſue from thence, unleſs you diſcharge the Vein in ſome other Place. This is the Reaſon why *Phlebotomy* is adminiſtred in violent Bleeding at the Noſe, or to prevent the exceſſive Defluxions of the Humours upon the affected Part.

All Sorts of Ulcers, whether corroſive, carneous, or fiſtulous, require *Venæſection*. They owe their Cauſe to a corroding acrimonious Seroſity, which ſeparating it ſelf from the Blood, is diſcharged upon the exulcerated Parts, and produces thoſe Symptoms. The Firſt Indication in the Cure of theſe Ulcers, is the ſweetening of the Blood; but before we can expect to attain to this End, 'tis neceſſary to take away a Part of that Blood, without which it will prove Labour in Vain to attempt its Correction, to reſtore it to its natural Sweetneſs, and that balſamick Virtue, which muſt of Neceſſity bear a great Share in the Reunion of Wounds.

All Sorts of Fractures without Exception, ſo ſoon as they are reduced to their natural Poſition, require Phlebotomy, to prevent Defluxions upon the Part put into much Diſorder by the Dilaceration of the Fibres, Muſcles, and Membranes; for there will infallibly enſue a Concretion of the Blood, which would doubtleſs be much greater, were it not for *Venæſection*: So that this Remedy being of ſingular Uſe in ſuch-like Occaſions, 'tis better to bleed twice than once, and not to be too ſparing in an Operation, the Advantage whereof is ſo great, by the univerſal Conſent of all ſuch as have made due Trial of it.

'Tis well known, that Luxations cannot be reduced without a forcible Extenſion; and that this violent Operation cannot be made without Pain. And as it is natural for all Pains to cauſe a Fluxion upon the affected Part, ſo this Defluxion would infallibly be much greater, eſpecially in plethorick Bodies, were it not for *Venæſection*, which

which by emptying in ſome meaſure the Veſſels, does hinder the Blood from diſcharging it ſelf upon that Part.

We do not always delay *Venæſection* till the Operation is performed; but we are beforehand by adminiſtring one or more Phlebotomies to the Patient, by way of Preparative, to accuſtom him to thoſe we are to make after the Operation is performed.

I have heard the moſt celebrated Lythotomiſts confeſs, that they never proved more ſucceſsful in their Cures, than when they frequently adminiſtred *Venæſection* to the Patients: And all the noted *Oculiſts* never fail to bleed frequently in the Diſeaſes of the Eyes. And all our moſt famous Chirurgeons take it for a general Rule, not to confine themſelves to any determinate Number in the performing of the Operation of *Phlebotomy*, but reiterate it as often as they judge it neceſſary for the Accompliſhment of their End or Deſign, which is the Curing of the Patient.

'Tis agreed on all Hands, that *Bleeding* and *Purging* are the Two *grand Remedies* of all; the firſt takes away ſome Part of the Blood, and the other the noxious Humours of the Body: But conſidering that *Venæſection* is ſo far in our Diſpoſal, that the Blood may be ſtopt ſo ſoon as you perceive the Patient not to be any longer able to bear it, or that he falls into a Swoon: Whereas on the contrary, when a Purgative is once down, there is no ſtopping its Operation, be it never ſo exceſſive, and attended with never ſo ill Accidents. *Phlebotomy* may therefore with a great deal of Reaſon challenge the Precedency and Firſt Rank.

Thoſe that love to play the Criticks in every Thing, and will, as the Saying is, ſpy out Spots in the Sun at Noon-day, tho' they are forced to own *Venæſection* to be the moſt Sovereign Remedy of all, they do nevertheleſs inveigh againſt too frequent Bleeding, under Pretence that it muſt be look'd upon as an Abuſe to let Blood in all Diſtempers; and that to adminiſter Phlebotomy Eighteen or Twenty Times during the Courſe of one Diſeaſe, is to exhauſt the Patient of all his natural innate Vigour.

To the Firſt Objection it is anſwered, That all Diſeaſes have originally their Riſe in the Blood, it being a Compoſition and Mixture of an infinite Number of Juices, which circulating through all the Parts of the Body without Intermiſſion, and being very ſubject to Corruption, whether by the foreign fermentative Particles, which are carried into it together with the nutritious Parts, or whether for want of due Spiration, or ſome other Defect in our natural Functions; theſe are not to be corrected, or reduced to their natural Force, without having Recourſe to the head Spring thereof, *i. e.* by taking away the Blood and Humours, which produce that Diſtemper we intend to cure.

In Anſwer to the *Second* it is to be obſerved, That we always regulate Bleeding leſs or more, according to the Nature of the Diſeaſe, and the Strength of the Patient. If a Chirurgeon ſhould go about to bleed his Patients all alike, and that in all Diſtempers, without having a due Regard to thoſe Two Circumſtances, this would actually be a great Abuſe, and the Chirurgeon muſt be ſuppoſed to act without underſtanding the Cauſes of the Diſeaſes that are before him: But what I told you before amounted to no more than this, That there is no determinate Number of adminiſtring *Venæſections* for every Diſeaſe, no more than for every Patient. There are certain Diſeaſes which will give way to Two *Venæſections* only; whereas others will not be ſubdued by a Dozen: And if it happens now and then that Eighteen or Twenty Phlebotomies are to be adminiſtred, this muſt be ſuppoſed to have been done in ſuch Perſons as were exceeding ſanguine, and required ſuch plentiful Inanitions, to curb the Violence of the Diſeaſe; and in thoſe Conſtitutions you ſhall find them ſtronger after ſo many Phlebotomies, than others are after three or four times Bleeding.

I remember that about Twenty Years ſince, a certain Monſieur ----- appear'd at Court, who had acquir'd a conſiderable Reputation at *Paris* by his Railing againſt *Venæſection*, though elſe he was of few Words, and of a dry melancholy Diſpoſition. He gave out, that he was a Perſon of Quality; That he had Riches enough, and did practice Phyſick upon no other Account than to ſerve his unfortunate Fellow-Chriſtians with his extraordinary Secrets, *&c.*

This

This inticed Madam *de Monteſpan* to ſend for him to viſit the Duke *de Maine*, who was very ill at that Time; and he was admitted alſo to ſpeak with the King: But when the Matter was brought to the Teſt, it being found that he had but little to ſay in his own Behalf, and his pretended Secrets, beſides inveighing againſt Phlebotomy, his Reign at Court was not of a long Duration; he was ſoon ſent back to *Paris*, where from that Time forward his Reputation did ſink to ſuch a Degree, that within Two Years after you ſhould not as much as hear him mentioned by any Perſon of Diſtinction.

An able Chirurgeon ought nevertheleſs to adminiſter Phlebotomy with Diſcretion: A Sanguine Conſtitution requires more Bleeding than Perſons of another Temperament; aged Perſons much leſs than young ones; as likewiſe labouring People leſs than thoſe that lead an idle Life; leſs Married People than ſuch as abſtain from Women; leſs in the Summer and Winter, than in Autumn and Spring; and laſt of all, thoſe that have been affected with ſome exceſſive Flux of Blood, whether by the *Hemorrhoides*, by a Wound, by the Menſtrual Purgations, or any other Way; tho' after all, he muſt regulate himſelf in this Operation, as well as in all others, according to the Rules of Prudence and Diſcretion.

Some Foreign Phyſicians ſeem to be amazed at our Bleeding more frequently in *France*, and more eſpecially at *Paris*, than in any other Place of the World: But the Reaſon is obvious, for there is more Blood made than in other Places, the Climate being more temperate, the Air not ſo ſubtil, and our Nouriſhment exceeding good.

In hot Countries the Spirits are ſoon diſperſed, and conſequently frequent Phlebotomy cannot ſo conveniently take Place there; and the abſolute Neceſſity there is of preſerving the native Heat in very cold Countries does alſo forbid this Practice; for frequent Phlebotomy does not ſuit well with either of thoſe two Extremes.

But among us, where all our Aliments are in a Manner converted into Nouriſhment and Blood, and where conſequently moſt of the Diſtempers owe their Riſe to Repletion, we are under an abſolute Neceſſity of procuring, an Inanition, if we will promiſe our ſelves a happy Succeſs in our Cures.

Of this we are convinced by Experience; and 'tis ſcarce poſſible for us to deviate from the true Path in following ſo good a Guide. Add unto this, That People live ſo very luxuriouſly at *Paris*, and that to pleaſe and acuate their Appetites, they have, and do ſtill, invent ſuch Variety of *Ragoût's* and Sauces, that it is not to be wondered at in the leaſt, that there is more Blood made here than in other Places.

Phlebotomy may be and is adminiſtred in divers Parts of the Body; in the Arms, the Feet, the Head, and in the Neck. Our firſt Diſcourſe is directed to that of the Arm, after which we ſhall treat alſo of thoſe of the Foot, Head, Neck, *&c.*

A Chirurgeon who pretends to perform this Operation of Bleeding with the utmoſt Exactneſs, muſt be provided with certain peculiar Qualifications. He muſt have a very quick Sight, to be able to diſtinguiſh even the ſmalleſt Objects. He ought alſo to have a very ſteady and light Hand, that he may be able to judge the better by Contact or Feeling; and therefore muſt abſtain from any hard and laborious Exerciſes, as well as from exceſſive Drinking; leſt he ſhould be called to a Patient when he is incapacitated by the Uſe of ſtrong Liquors to perform his Function.

But after all, it is not ſufficient alone for a Chirurgeon to have good Eyes and Hands, he muſt be provided alſo with convenient and choice Inſtruments to perform the Operation without Pain: For on the Choice and Goodneſs of them depends in a great Meaſure the Succeſs of an eaſy Bleeding, becauſe if the Chirurgeon's Hand be never ſo light, a blunt Lancet will produce a painful Operation; and therefore I adviſe all Chirurgeons not to ſpare for any Coſt in this Kind, to buy them of the beſt Workmen or Inſtrument-makers, and let no body elſe ſet them afterwards but thoſe who ſold them, they being obliged to manage them to the beſt Advantage for their own Reputations Sake.

I have for theſe Fourteen Years paſt made uſe of no other Lancets but thoſe made by Mr. *Coxſin*, a famous Cutler at *Lyons*, and

am ſo uſed to them, that I cannot bleed well with any other. Beſides this, a Chirurgeon ought to be provided with Lancets of a different breadth and length, to make Uſe of them according as he meets either with a larger or leſs Vein to be opened; and tho', as I told you before, Phlebotomy ſeems to be the moſt inconſiderable and eaſieſt among all the Chirurgical Operations, it nevertheleſs challenges your ſerious Conſideration, in Reference to Three different Times, *i. e.* What is to be done before, during, and after *Veneſection.*

In caſe Phlebotomy be to be adminiſtred by the Direction of a Phyſician, the Chirurgeon, without further conſidering of the Matter, is to go about the Buſineſs he is called for, the ſooner the better; but if it is the Patient that propoſes and requires it, he ought then to examine into the Reaſons that induced him to be let Blood: For if it ſhould ſo happen that he has but juſt before overcharged himſelf with Victuals; or elſe, that he had been faſting for a conſiderable Time; that he had juſt then either the cold or hot Fit of an Ague or Feaver upon him, or was in a Sweat upon the going off of it; if he was in a Paſſion, *&c.* there would be ſufficient Reaſon for a Chirurgeon to delay the Bleeding to a more proper Time; but if he meets with nothing that may reaſonably hinder it, he may make all the neceſſary Preparations for the Operation.

The firſt Thing to be done, is to light a Wax or Tallow Candle; tho' ſome prefer a Tallow Candle before a Wax Light, becauſe, ſay they, if ſome of the Wax ſhould happen to drop upon the Arm, it would prove more painful than the Tallow or Greaſe. But I can aſſure you, that for theſe 36 Years laſt paſt that I have practiſed Chirurgery, I always have made Uſe of Wax Candles without ever meeting with ſuch an Accident; to avoid which, the beſt Way is, to make Uſe of an End of a Wax Candle, which, beſides this, is more commodious for this Purpoſe than a whole one, which cannot be ſo conveniently held and placed where Occaſion requires, by Reaſon of its Length. I think your ſmall Wax Lights are better than any, becauſe they may be bent and turned at Pleaſure; but you muſt take Care that the Cotton be good, without which they will not afford you a clear Light.

The next Thing you have to do, is to have at Hand a ſmall Linen Band, neither too new nor too old, of about the Breadth of an Inch, and an Ell and a half in Length. I very much approve of thoſe they make Uſe of in *Flanders*, in the Monaſteries there, which have a Piece of Tape ſewed to each End, being much more convenient to be tied into a Knot than the Band it ſelf, which when tied together makes too big a Knot.

You muſt alſo get ready two Compreſſes of about an Inch Square, doubled ten or twelve Times together, that they may be ſufficiently thick to compreſs the Orifice of the Vein. Of theſe you muſt have Two, that in caſe the Blood ſhould burſt out upon the Firſt, you may not be to look for a Second to ſupply its Place.

The Band muſt have neither Seams nor Hems, thoſe of Thread are not for your Purpoſe, they do not make a ſufficient Compreſſion upon the Compreſſes, and a Seam will occaſion Pain in tender Arms.

You muſt be provided with three ſmall Porringers, placed upon Three different Plates, for if you put them all Three in one large Diſh, they cannot be filled ſo conveniently.

You muſt always have Three of theſe ſmall Porringers at Hand, tho' perhaps you intend to fill only Two; for ſometimes whilſt you are a Bleeding it is thought convenient to take away ſomething more. Theſe ſmall Porringers have each a ſmall Handle, and ought each to contain Three Ounces, that ſo you may not be miſtaken in the exact Quantity of the Blood that is taken away.

Monſieur *Ducheſne*, Phyſician in Ordinary to the Duke of *Burgundy*, always adviſes to let Blood in the Evening, provided you are at Liberty to chooſe your Time; but as far as ever I heard, he is the only Phyſician that gives the Preference to the Evening before the Morning in Phlebotomy; for it is the general Opinion of the Chirurgeons, founded upon their own Experience, that in the Evening we are colder, and that the Veins will not ſwell ſo eaſily, nor the Blood come ſo freely.

You

You muſt have at hand alſo a Glaſs with clean Water, and another with Vinegar, or ſome *Hungary*-Water, in caſe the Patient ſhould be ready to fall into a Swoon.

Then let the Patient be laid near to the Edge of the Bed, towards that Side where the Arm where the Vein is to be open'd is; and you may put a Cuſhion or Pillow behind his Back, to keep him ſitting upright. Over the Quilt or Rug of the Bed you muſt ſpread a Linen Cloth, or ſome other Coverture, to preſerve the Bed from being ſpoiled by the Blood, that will ruſh out with ſome Violence at the firſt Opening of a Vein: And if you think the Light to be injurious or incommodious to the Patient, keep the Curtains drawn cloſe.

You muſt order the Wax-candle to be held by ſome Body that has a ſteady Hand, and who is not afraid of ſeeing Blood; for in caſe he ſhould turn away his Head at that very Nick of Time when the Vein is to be prick'd, the Chirurgeon may eaſily miſtake his Aim; and therefore the ſureſt Way for a Chirurgeon is, when he is to bleed any Perſon of Note, to bring One of his Apprentices along with him, who may hold the Candle, and at the ſame Time ſupport the Patient's Arm, and keep it from being drawn backwards when the Lancet enters the Vein.

A Chirurgeon ought to take Care alſo, That there be nothing about himſelf that may be troubleſome to himſelf in the Operation. Thus if his Sleeves are too long he muſt turn them up: If his Periwig be in his Way he muſt tie it back with a Riband: And to be ſhort, he muſt avoid every thing that may prove a Hindrance to him in Bleeding. But at the ſame Time I would not have him run into Extreams on the other Side; as I know one, who ſhuts all the Doors and Windows; who will not ſuffer any Body to ſtir or ſpeak in the Room when he is to adminiſter *Venæſection*; and makes as many Ceremonies and Preparations as if he were to cut off a Leg or an Arm. Theſe are Fooleries, which prove not only uſeleſs, but ſometimes dangerous alſo, and ſerve only to ſtrike a Dread into the Patient, which hinders the Afflux of the Blood.

As there are ſome Women who love to tell the Chirurgeon ſtrange Stories, how difficult a Task he will find it to let them Blood; ſo there are ſome Chirurgeons who delight in repreſenting the intended Phlebotomy as ſuch, (whether it be really ſo or no, matters not) in Hopes by this Means to gain themſelves a Reputation of being dextrous in their Art. Both are in the Wrong, ſince theſe pretended Difficulties may prove noxious as well to the Chirurgeon as to the Patient, by creating a needleſs Fear in either of them.

The beſt Way for a Chirurgeon to gain a Reputation of being an able and dextrous *Phlebotomiſt*, is not to be fearful, let there be never ſo much Difficulty in the intended Operation; and not to give the leaſt Signs of Fear; for if another Chirurgeon has let Blood in the ſame Arm, Why ſhould not I? ought he to ſay to himſelf: For though there may be no ſmall Difficulty in the Bleeding of ſome Arms, 'tis not impoſſible to let Blood there: For in ſuch Caſes as this, a Chirurgeon ought rather to have and ſhew a good Confidence in his Art and Dexterity, than betray his Fear.

I would have a Chirurgeon be likewiſe *Ambidexter*, *i. e.* that he may be able to bleed as well with the Left Hand as with the Right; for *Venæſection* in the Right Arm is beſt adminiſtred with the Right Hand, and of the Left Arm with the Left Hand; and therefore I would have him accuſtom himſelf to it, from that very Time he begins to apply himſelf to the Operation of Phlebotomy.

For it is obſervable, That ſuch Chirurgeons as cannot uſe both Hands alike in Bleeding, avoid as much as they can to bleed in the Left Arm, though there is more frequent Occaſion for it there than in the Right; and conſequently they cannot always avoid it: For, beſides that, thoſe Diſeaſes that require *Venæſection* happen on both Sides alike, we always prefer the Left Arm to the Right in thoſe *Venæſections* that are adminiſtred by Way of Precaution; that ſo we may keep the Right Arm free, and make uſe of it at Pleaſure, in Writing, or any other Affairs: Nay, I have known a great many, who always chooſe to be let Blood in the Left Arm; for, ſay they, if by Miſchance a Tendon or an Artery ſhould

be prick'd, a Man had better be lamed in the Left than in the Right Arm.

A Chirurgeon, after having taken all these Precautions beforehand, he may now securely take hold of the Patient's Arm, in order to proceed to the Operation it self: And though this Operation consists only in giving one Prick, there are nevertheless certain essential and most necessary Circumstances that must not be neglected, if you propose to do it as it ought to be done; and therefore I am now going to examine into those Circumstances one after another in their due Order, to shew you in what Manner you must proceed in, and accomplish this Operation it self.

The First Thing you have to do after you have taken Hold of the Arm, is, to strip it quite naked at about Four Inches above the Elbow; and if you find the Wastcoat or Shirt-Sleeve too streight, you must have it unrip'd; for this Streightness would be in lieu of a Counter-Ligature, which intercepting the free Passage of the Blood, must prove a Hindrance to the Bleeding. If Women have very streight Wastcoat-Sleeves, you must let them be pull'd off.

Then take a Napkin, and fasten it with a large Pin under the Arm, so as to spread it over the Patient's Breast and Shoulder, to prevent his Clothes being spoil'd by the Impetuosity of the Blood at the First Opening of the Vein; a Thing not to be neglected above all Things when you are to bleed Ladies of Quality, who never forgive a Chirurgeon if he disturbs or spoils any Thing belonging to their Dress.

The Arm being stripp'd naked above the Elbow, and the Napkin plac'd as has been said, make a Ligature with a Piece of Woollen Cloth, (which should be red, that it may not be spoil'd by the Blood) of about a Yard in Length, or more, that it may be long enough for any Arm whatever, and of an Inch in Breadth, that it may make a Compression without Pain; for if it be too narrow, it will cut the Arm, and if broader, it will not make a sufficient Compression. It ought to be of Woollen Cloth, neither too fine nor too coarse: Either of these Two will be attended with certain Inconveniencies.

But before you put on this Ligature, you must take Care of Two Things: *First*, that the Arm be extended, and in the same Position it ought to be in when the Vein is prick'd with the Lancet; and *Secondly*, that the Hand be not closed, but open and extended, so that the Palm of the Hand may rest against the Chirurgeon's Breast, lest the Muscles of the fore Arm being tumefied, should alter the Situation of the Veins.

You take this Ligature very near its Middle, and fix this Middle Part about Two Inches Breadth above the Bending of the Arm, so that the Chief of the Band, which hangs down on the Inside of the Arm, be somewhat longer than the other, because this Chief is to make a running Knot. You must make the Two Chiefs come across each other on the back Part of the Arm; and after having made a Second Circumvolution over the First, you tie up the Ligature on the Outside of the Arm, and tie it only with a simple running Knot; the Two Chiefs or Ends of which hang downwards on the Backside of the Arm.

All this Time you must not make your Ligature too streight, but only so much of it as is sufficient for the Compression of the Vein, and intercepting the Blood within the fore Arm without streightening the Artery, which must bring the Supply of Blood to the Veins of the Arms. You may put the Arm under the Bed-Clothes, and wrap it up well in a warm Napkin, if Occasion requires.

In the mean while the Chirurgeon takes the Lancet, *A.* out of his Lancet-Case, such as he judges most proper for the Vein that is to be open'd; for he ought to be provided with some larger, some narrower, to make use of them as he shall find Occasion. Some of these Lancets have very nice Points, being design'd for those that have a very thin and tender Skin; whereas there are others, adapted more especially for such as have a very coarse and hard Skin.

Having pitch'd upon what Lancet he thinks best, he may open it, but not so as to make an acute Angle, but a little obtuse and oblong, like that mark'd with *B.* which he puts into his Mouth, with its Point to the Left, when the Venæsection is to be performed in the Right Arm, and turn'd to-

to the Right Side when he is to bleed in the Left Arm; for by ſo doing he will find it more commodious to take hold of the Lancet.

Then he takes hold again of the Arm, ſo as to extend it, and let it reſt againſt his Breaſt as before, with the Hand cloſed or doubled together, the Thumb being ſhut in with the Fingers, that ſo the Muſcles being tumified by this Action, may thruſt the Veins the more outwards.

He that holds the Candle ought to ſtand at the Left Side of the Chirurgeon, near the Edge of the Bed. If the Venæſection is to be made in the Right Arm, he muſt hold it with the Left Hand, and a Plate, with a ſmall Porringer upon it, with the Right, underneath the Patient's Arm, to catch the Blood ſo ſoon as the Vein is open'd. 'Tis the Chirurgeon's Buſineſs to direct where he that holds the Light may be moſt conveniently plac'd, either on the Outſide or Inſide of the Arm, according as he finds it moſt commodious for his Light. After which he is to enter upon a Scrutiny of the Veins, to ſee which of them is the beſt for his intended Operation.

There are Four Veins fit for *Venæſection* in the Arm.

The *Firſt* is the *Cephalick*, ſo called from its being the higheſt and neareſt to the Head.

The *Second* is call'd the *Median*, becauſe it has its Situation in the Middle of the Arm.

The *Third* the *Baſilica*, becauſe it has its Poſition at the *Baſis* of the Arm.

And the *Fourth* the *Cubitalis*, having obtained its Denomination from its being near to the Cubit.

Among theſe Four Veins, the *Mediana* and *Baſilica* are moſt frequently open'd, becauſe they are the largeſt, and the moſt commodious both to be open'd and to procure the free Efflux of the Blood; but at the ſame time they are alſo the moſt dangerous.

The *Baſilica* has ſometimes its Situation ſo near unto the Artery, that there is no ſmall Hazard leſt you ſhould open it together with the Vein. And the *Mediana* having its Poſition upon the Tendon of the *Biceps*, requires all the Dexterity a Chirurgeon is capable of in this Caſe to avoid pricking it: For the Artery and the Tendon are here to a Chirurgeon what a Rock is to a Mariner, which he muſt ſhun as he tenders the Welfare of his Patient.

The Situation of the *Cephalick* Vein is ſuch as not to permit the Blood to ruſh out in the Nature of an Arch, or like the Out of a Fountain, being placed at the uppermoſt Part of the Arm.

When the Cubital Vein is to be open'd, the Patient is obliged to turn his Arm in ſuch a Manner as is incommodious both to himſelf and Chirugeon; beſides that, the Skin being much thicker in that Part than within the Bent of the Arm, the Operation will prove more painful: And this is the Reaſon why theſe Two Veins are ſeldomer open'd than the other Two, notwithſtanding it may be done without the leaſt Danger, and without running any Hazard of pricking an Artery or Tendon, there being none near them; and therefore I would adviſe a young Chirurgeon, in caſe he apprehends any Danger in opening the *Median* and *Baſilica*, rather to pitch upon one of the other Two Veins, than to expoſe his Patient and Reputation to Danger: For it is much better to perform an Operation without all the required Exactneſs and Applauſe of the Standers by, than to run the Riſque of Laming his Patient for the whole Remainder of his Life.

But all the Arms do not ſhew Four Veins that are fit for Bleeding; ſome have only Three, or perhaps Two; and in ſome Arms the Chirurgeon thinks himſelf very happy if he can find One.

When ſo it happens that the Veins lie ſo deep, that they are neither to be ſeen nor felt, 'tis the ſame Thing to the Chirurgeon as if they were not at all. In ſuch a dubious Caſe he muſt accommodate himſelf to the Structure of the Arm: He muſt be ſatisfied with what Veins he is able to meet with, and do as well as he can to come off with Reputation; for what I ſaid before, that he muſt open either the *Cephalick* or the *Cubital* Vein, muſt be underſtood of thoſe Arms where it is in his Power to chooſe his Vein.

Neither is it ſufficient alone to have choſen a Vein, you muſt pitch upon the exact Place where it is to be open'd, and this

Place

Place ought always to be where the Vein makes its Appearance beſt, and that below the Scars made by preceding *Venaſections*; for if you open above it, the Blood would not flow ſo freely, becauſe the Vein being ſtreighten'd in that Place by the Scars, the Blood cannot ruſh out ſo freely as below, where the Vein has a larger Compaſs.

And therefore a Chirurgeon who is to bleed frequently in the ſame Arm, is to manage it to the beſt Advantage, *i. e.* by beginning to prick the Vein as high as he can, and ſo go on lower and lower, and make his Openings as cloſe to each other as he can, by which Means he will make a ſucceſsful Operation, not only for once or twice, but alſo will reſerve ſufficient Room, that may ſtand him in good Stead in proper Time and Place.

The Chirurgeon having pitch'd upon the exact Place where the Vein is to be open'd, he muſt mark it with his Nail, but not only with One Pinch, but by Two, *viz.* one above the Vein, and the other below, at ſuch a Diſtance from each other as he judges may exactly contain the Bigneſs of the Vein betwixt both, that ſo he may make the Opening from one Mark to the other. After this he muſt draw the Ligature more ſtreight, in order to keep the Skin of the Arm the more firm; for now it is no great Matter if you make a Compreſſion upon the Artery, the Vein being ſufficiently ſwell'd by this Time. This done, you muſt rub with your Right Hand the fore Arm, from below upwards, to make the Blood contained in the Vein aſcend toward that Part where you intend to open it; and at the ſame Time you muſt graſp the Arm with your Left Hand, and by fixing your Thumb upon the Vein, prevent the Blood from falling back again to the Hand. And laſtly, before you take the Lancet out of your Mouth, lay the *Index* or Fore-Finger upon the Place where the Marks are, to be ſure that the Vein has not changed its Situation.

If the Chirurgeon finds the Vein where he expected it, 'tis then that, without turning away his Face from the Place marked before, he takes his Lancet, and holding it betwixt Two Fingers, *viz.* the Thumb and *Index*, in the Middle of the Iron, (to keep it the firmer) and letting it reſt upon the End of the other Fingers, to keep his Hand the ſteadier when the Punction is to be made, he fixes his Lancet upon the inferior Mark which is below the Vein, and ſo thruſts it in till he thinks it deep enough within the Vein, and in withdrawing it makes an Elevation, *i. e.* he cuts the Skin aſunder as far as he judges it expedient. The Blood follows the Lancet at the ſame Inſtant; for as he draws it back, the Blood will ſpout forth, leſs or more, according as the Vein is bigger or leſs, and the Blood is full of Heat and Spirits.

A Vein may be open'd Three different Ways, *viz.* Lengthways, in Breadth, and Obliquely: The laſt is to be preferred before the other Two, not only becauſe it is more commodious for the Chirurgeon, but alſo becauſe it is more beneficial to the Patient, by making a larger Orifice, which facilitates the Efflux of the Blood.

If you will open a Vein as it ought to be, the Two Fingers only which holds the Lancet ought to perform this Function. Theſe being bent when they approach with the Lancet to the Vein, and the Hand reſting at the ſame Time upon the other Fingers, which are ſupported by the Patient's Arm, the Lancet enters the Vein by the Elongation or Extenſion only of the Thumb and the *Index*, and is withdrawn by the ſame. For if a Chirurgeon ſhould perform this Operation, which requires a light Hand, with his whole Arm or Hand, he would make heavy Work of it.

The Opening of a Vein is made at Two diſtinct Times, *viz.* that of the *Punction* and that of *Elevation*: The *Firſt* is made at that Inſtant when you make way with the Lancet from the Outſide inward; and the *Second* at that Time when you withdraw it from within outwards. When the Lancet enters, it cuts with both its Edges; but as it comes out, it only cuts with its upper Edge, which is raiſed a little upwards as you pull it out. Some I know add to this the Time of *Inciſion*, which they place betwixt the other Two; but this is multiplying Things without Neceſſity; it being impoſſible that either the Punction or the Elevation ſhould be made without an Inciſion.

So ſoon as the Chirurgeon ſees the Blood ſpouting forth, he puts his Lancet together

and lays it upon the Plate, upon which the First small Porringer is plac'd; for if he lays it upon the Bed, it may fall down and be spoiled, or else he may be to look for it afterwards among the Bed-Clothes, or the Linen Cloth which was laid over the Bed.

If the Candle is at the Inside of the Arm, let it not be removed under the Patient's Arm, for fear of burning it; but on the contrary let it be moved forward into the Middle of the Bed, that so you may see the Coming out of the Blood the better. Some Patients are fond of holding it themselves: The Chirurgeon has no Occasion to be against it, as well because it will give the better Light, as also because it will divert the Patient, and hinder him from falling into a Swoon.

If you find the Blood, after its first rushing out like a Spout in the Form of an Arch, begin to slacken, this must be attributed to the Ligature, which makes too streight a Compression upon the Artery; you must therefore loose the Ligature a little, and you will see the Blood flow as freely as before.

This Phenomenon alone is sufficient to convince the Ancients of the Veracity of the Circulation of the Blood: For it being impossible that all the Blood which is drawn should be contained in the fore Arm, it must of Necessity be supplied by some other Conduit; and this Conduit cannot be the Vein, because its Passage is intercepted by the Ligature, and therefore it must be by an Artery, there being only those Two Sorts of Vessels which supply the whole Machine of our Body with Blood.

Notwithstanding the Venæsection is as well performed and as effectual when the Blood runs along the Arm, as when it comes out like a Spout, yet the latter being coveted and admired by most People, the Chirurgeon must endeavour to please them as much as he can; which may be done in some measure if he takes care either to raise or lower the Skin, so as to make the Aperture in the Skin to be exactly opposite to the Orifice of the Vein. He may also let the Patient bend his Arm a little, so that the Skin pressing only loosely upon the Orifice, it affords the easier and a freer Passage to the Blood. He must also not neglect to support the Patient's Arm, that it may not be tired before the Operation is over.

However, these Instructions are not so necessary but that they may be pass'd by sometimes. And Monsieur *Daquin*, the King's Chief Physician, always enjoins the Chirurgeons to let the Blood run along the Arm, because he accounts this the better Way of Bleeding.

If a Chirurgeon happens to meet with a cowardly Patient, who dares not look upon his own Blood, he must make him turn his Face another Way. He may also give something or other in the Patient's Hand that is round, by the turning whereof in a regular Manner, the Blood is carried with the greater Celerity towards the Aperture in the Vein.

When you are to bleed, you ought not to go about it without having some at hand to attend you. There ought to be Two at least, *viz.* One to hold the Candle with one Hand, and the little Porringer with the other, to catch the Blood; and another, who is to bring you fresh empty Porringers, and to carry away those that are fill'd with Blood; who is to reach you the Band, and Compress when you want it, and who may be at hand to bring any thing else you stand in need of, in case the Patient should fall into a Swoon.

No certain Rules are to be prescribed in relation to the Quantity of Blood that is to be taken away by bleeding, the same being to be accommodated to the different Circumstances of the Subject before you.

If a Physician has prescribed a determinate Quantity of Blood to be taken away, you may exceed about a Dram, but no more. If the *Venæsection* be intended by way of Precaution, the Quantity must be proportioned to the Strength and Constitution of the Patient; and if he bears it well, you may take away the more: But if he turns pale, or begins to be sick and out of Order, you must immediately stop the Blood.

There are so many and such various Circumstances to be considered in this Point, that it is next to an Impossibility, and no less useless, to pretend to enumerate them here. But I cannot pass by in Silence One general Observation I have made, *viz.* That when I have

have bled a Husband in the Presence of his Wife, she would always exclaim against the taking away of too much Blood; whereas on the contrary, when I administred Phlebotomy to the Women in the Presence of their Husbands, they would be sure to cry out to take away more Blood. I suppose both had their peculiar Reasons, which may easily be guess's at, without going to a Conjurer for it.

So soon as the small Porringer, *C.* is near full of Blood, you must call for a Second, *E.* which must be placed under the First, that so as you take away the First, the Blood that happens to run over may fall into the Second; and in the same Manner you must proceed with the Third, *F.* and whilst the Third is filling, you must get ready the Band and Compresses; and let him who carries away the Porringers with the Blood, place them in their due Order, according as they were fill'd.

When you intend to stop the Bleeding, you must undo the Ligature; but let not the last Porringer be taken away till you have stopp'd the Flux of the Blood. For this Purpose you must put Two Fingers, *viz.* the Fore and Middle Finger of the Left Hand, on one Side of the Orifice, and with the Help of these Two Fingers make a small semicircular Motion with the Skin, by which Means the Blood will be stop'd without as much as losing one Drop: After which let the last Porringer with Blood be placed near the others in its proper Place.

This done, the Chirurgeon takes a small Compress, *G.* in his Right Hand, and before he applies it, removes the Two Fingers which retained the Orifice close together, in order to let out some small Quantity of Blood: Then he puts them on again; and thus having stop'd the Blood a Second Time, he applies a Compress to the Orifice, and over that another somewhat larger, and keeps them both on with the Left Hand, whilst he washes off the Blood that has stained the Arm with a Napkin. Then he applies over them the Band, *H.* at about Six Inches Length from one of its Ends. This he takes on the back Part of the Arm, and makes a circular Circumvolution above the Elbow, and bringing the Band back over the Place where the Incision has been made, he makes another circular Circumvolution about the fore Arm, and thus he goes on, running always across the Compresses as often as the Length of the Band will give him Leave.

The Two Extremities of the Band, *I, I.* he ties on the back Part of the fore Arm; and for fear the Compresses should slip away from under the Band in the Night-time, he fastens them to it with a large Pin. Then he pulls down the Wastcoat and Shirt-Sleeve; and ordering the Patient to keep his Arm bent upon his Stomach, he puts him into the Bed again as before.

I told you you should apply Two Compresses, and not without good Reason, it being certain, that a small Compress under another that is larger does cause a closer Compression upon the Incision than a single One, and consequently accelerates the Reunion of the Wound: Though at the same Time I am not ignorant, that most commonly they make use of no more than One, and so do I my self sometimes. For the rest, if there sticks any Blood to the Compress which you are going to apply, you must not lay that Side where the Blood is to the Wound, but the opposite Part. In former Times they used to dip their Compresses in Water; and there are some Chirurgeons to this Day who follow this Practice: And I remember my Master taught me so to do; but of late I have laid aside that Custom: I apply it dry, and find my self very well by it, as well as most of the other Chirurgeons of Note, who of late Years do not dip these Compresses in any Liquor; for a Compress that is dipp'd, when it dries, becomes hard, sufficient to hurt the Part where it lies. There are but Two Accidents wherein I think they ought to be dipp'd, *viz.* when there is a small Rising about the Orifice, when it is very small, or else when you suspect some concreted Blood to be lodged betwixt the Skin and the Fleth; but these Accidents you need not fear, provided you have made your Orifice wide enough.

After the Operation of Bleeding is performed, and the Arm done up, the Chirurgeon has not as yet fully accomplished his Duty; for if it so happens that the Patient falls into a Swoon, 'tis his Business to recover him to his Senses, the sooner the better

by pulling the Pillows from under his Head, and lying him at his Length; by casting Water in his Face; by holding Vinegar, *Hungary*-Water, or some other strong Thing, to his Nose; by rubbing his Hands, and opening the Curtains of the Bed, and the Windows of the Room, to give him fresh Air, and promote free Respiration.

So soon as the Patient is come to himself, you may give him about half a Glass full of half Wine and half Water: But if it be in a Fever, you may order him a Tisane, and so leave him at Rest, after having put his Arm into a proper Situation.

After the Chirurgeon has wholly dispatched his Business with the Patient, he is to go to the Table, to make Inspection into the Blood.

Some are very ceremonious in blowing off the Froth that is upon the Blood, or else take it off with a Card or Feather; and by so doing, pretend to have a better Insight into the good or ill Disposition of the Blood, when the Surface is clear from it.

As for my own Part, I am very free to confess, that I never did give my self the Trouble to take off the Froth; it being my Opinion, That even by this small Motion the superficial Fibres of the Blood may be disordered, and consequently prevent the having an exact Insight into the Disposition of the Blood; the more, since the Froth does not cover the whole Surface of the Blood in the Porringer, so that, without any further Trouble, by that Part which is clear, you may give your Judgment of the Nature of the Blood.

Besides, nothing is more frequent than for a Physician, the next time he visits his Patient after Bleeding, to enquire, Whether the Bleeding has been successful, and whether the Blood did come freely? So that when you have left the Froth upon it, it is a certain Sign that the Blood did come out like a Spout with some Vigour.

You must not fail to mark the Porringers, by putting a small Piece of Paper upon the First, Two upon the Second, and Three upon the Third; a Thing though in it self of little Consequence, yet if neglected, the Chirurgeon would perhaps be blamed for it, as if he had committed some great Crime, when they come to examine into and give their Judgment upon the Blood.

Some Chirurgeons mark these small Porringers with I, II, III, *&c.* but this is not so certain, for the Servant may mistake the Number, or it may be defaced by the Blood, and therefore the Papers are better.

After the Chirurgeon has well wash'd his Lancet and his Hands, 'tis then Time he should address himself to his Patient, and make him sensible that there was great Occasion for his being let Blood. If the Blood has followed freely and plentifully, he must represent to him the absolute Necessity there was of taking some of the Blood away, because this Superfluity of Blood might in all Probability have caused some very dangerous, if not mortal, Disease.

In case he happened to swoon away, and was scarce able to hold it out, he must be sure to tell him, that those Venæsections that touch the Heart are always the most beneficial.

If the Blood appears to be bad and corrupted, he is to tell him, that this Part of the Blood that is taken away, will be a Means, by promoting the Circulation, to purify the rest.

If it appears of a fine red Vermilion Colour, he must rejoice with the Patient, and represent to him, That what is left behind, is of the same Nature with this, and that such a Blood is an infallible Sign of Health and a long Life.

So that, to be short, let the Bleeding succeed, and the Blood appear in what Manner it will, he must know how to draw some advantageous Consequences from it, for the Satisfaction of his Patient.

After Venæsection is well administred, the Chirurgeon will have abundance of Questions ask'd him; as for Instance, Whether the Patient may take a Glass of Water immediately after Bleeding? He ought to be so far from denying him any such Thing, that he must rather advise him to it, because it can do no Harm, and may do Good; for the Water being soon convey'd into the Vessels, to supply the Place of the Blood that is taken away by Venæsection, it must of Necessity refresh and dilute the remaining Part thereof, this being the End for which it is given.

I have ſeen ſome Ladies order their Servants to bring in a Baſon with freſh Water, into which they had the Blood caſt as ſoon as it came out of the Vein; being of Opinion, that by a certain Sympathy the remaining Part of the Blood in their Veins ſhould receive a conſiderable Refreſhment. I will leave it to the Reader's Judgment, whether they were in the Right or not. For my Part, I did not think it worth my while to contradict them, being certain, that if this Mixture of the Blood with Water did not anſwer the deſired Effect, it could at leaſt do them no Harm.

Another Queſtion that is ſometimes put to a Chirurgeon is, Whether the Patient may ſleep after Bleeding? I know this is moſt commonly forbidden; but hitherto I can't ſee upon what Account, unleſs it were for fear that the Band about the Arm ſhould be looſen'd whilſt the Patient ſleeps. If there be any other Reaſons, I am free to confeſs my ſelf to be ignorant of them; but if there be nothing elſe, this alone is certainly not weighty enough to deprive the Patient of that ſweet and agreeable Repoſe which is the Effect of the *Venæſection*: And therefore, after I have ordered them a Glaſs of Water, I am never againſt their taking a good Sleep.

The Blood that is drawn and ſet by, muſt not be expoſed to the open Air, or in the Sun, but in the Shadow upon a Table, in a Place where it is neither too hot nor too cold, that ſo, by cooling gradually, the Separation of the Liquors whereof the Blood conſiſts may be made the better, ſo that each of them, at its own Leiſure, may take its proper and natural Place, according to its Gravity or Levity.

The Chirurgeon now takes his Leave of the Patient, with adviſing him to take ſome good Broth about an Hour after, as being the moſt proper Food after Bleeding; and ſo having received the Reward intended him for his Pains, he bids them all adieu.

But if the Chirurgeon is to viſit the Patient, or the Perſon he has let Blood, again; it is then expected he ſhould look upon the Blood, and give an Anſwer to all the Queſtions the Patient ſhall think fit to ask him concerning the good or bad Qualifications of the Blood.

Let the Blood be what it will, the Chirurgeon ought to take Care to ſay nothing that is uncomfortable to the Patient; and even if he finds it to have contracted ſome Degree of Corruption, which might likely be attended with ſome ill Conſequences, he ought not to alarm the Patient with Contingencies, but only tell him, That no Time muſt be loſt, to endeavour the correcting and purifying his Blood from thoſe ill Humours and Impreſſions, which, if neglected, would in all Probability ſoon after be followed by very ill and dangerous Symptoms.

'Tis a vulgar Error to imagine, That when you make a ſmall Orifice in letting of Blood, nothing but the pureſt Part of the Blood is evacuated: Notwithſtanding which, this Opinion is ſo univerſal, that it is a hard Matter to undeceive People upon that Head.

'Tis true, when the Blood comes out of the Vein with a ſlender Stream or Spout, it ſeems to be Red, and of a Vermilion Colour, becauſe it being ſome Time before the ſmall Porringer is filled up, the Air has the more Time to cool it, and enters into a Coagulation before the Separation of the Liquors are made: But after all this, it is neither the better nor the worſe, but the ſame with that which is left behind; and the ſame Blood, ſuch as it is in the Veins, makes its Paſſage through a ſmall, or through a large, Orifice made by the Lancet, juſt as we ſee the ſame Wine drawn out of a Veſſel through a ſmall and a large Pipe.

If you catch the Blood into the hollow Part of a Plate, it will appear of a very fine Colour; for being more expanded, it is ſooner cooled, and conſequently coagulated before there can be any Separation of the more groſs and Volatile Particles: Or, to ſpeak in the Language of our Modern Naturaliſts, it is more expoſed and touched by the Air; which leaving behind it a conſiderable Quantity of *Nitre*, occaſions that Vermilion Colour that is obſerved there.

But if the Blood be catched in deep and narrow Porringers, it the longer preſerves its natural Heat, and conſequently the groſſeſt Particles of all have Leiſure given them to ſettle to the Bottom, thoſe that are not

quite

quite ſo groſs occupy the middle Part, and the ſerous Part ſwims upon the Surface. I will give you an undeniable Proof of this Aſſertion: For when the Porringer is ſo full of Blood that it runs over, the Blood that falls upon the Plate is of a fine Colour, whereas that in the Porringer is ſo far different from it, that one would imagine they were drawn from Two different Perſons, whereas in Effect they are the ſame.

It is not required of a Chirurgeon to enter into an exact Scrutiny of the different Qualifications of the Blood; and therefore I will not enlarge upon that Point here, tho' they are the firſt that are asked divers Queſtions, and muſt give their Judgment about it. And a Chirurgeon, in caſe the Blood after the Orifice is made, ſpouts forth upon the Cloth, may by the Spots it makes judge whether it be good or bad; and during the Venæſection, as it runs into the Porringer, if a certain Vapour ariſing from the Blood ſtrikes the Chirurgeon's Noſtrils, he may alſo give ſome Judgment concerning its good or bad Qualifications. The reſt we will leave to thoſe whoſe Province it is to determine this Matter by Authority.

Phlebotomy, the moſt common and the moſt frequent among all the Operations belonging to the Art of Chirurgery, and which, in outward Appearance, ſeems to be the moſt eaſy and ſimple, is nevertheleſs (as we told you before) attended with moſt Accidents. Some of theſe happen thro' the Chirurgeon's Neglect or Miſtake, as when he pricks a Nerve, a Tendon, or an Artery; as on the other Hand, there are a vaſt Number of other Accidents and ill Conſequences, which are oftentimes laid at the Chirurgeon's Door, tho' he has performed the Operation never ſo well.

Thoſe that are the beſt Maſters in Phlebotomy, are moſt expoſed to this Cenſure; for having acquired a more than ordinary Reputation in this Operation, thoſe that are the moſt difficult are ſure to fall to their Share; and as in ſuch-like Subjects, by the univerſal Conſent of all the Chirurgeons, this Operation is the moſt hazardous, and moſt mortifying that can be to the Operator, ſo they are all inclined to lay aſide this Part of Chirurgery, under Pretence of being overwhelmed with Buſineſſes of greater Conſequence in our Art, and when they have done, they are glad to have been able to draw ſuch a pernicious Thorn out of their Feet.

To miſs a Vein without drawing Blood, is to be looked upon as the leaſt of thoſe Accidents; 'tis ſometimes much more prudently done to withdraw your Lancet without drawing Blood, than to labour in vain with the Point of your Lancet in the Arm, and pretend to draw Blood at any Rate: I ſay, 'tis much better to make a *Blank Venæſection* (as it is call'd by the *French*) *i. e.* without Blood, than to run the Hazard of pricking an Artery or a Nerve in the Arm, where the Vein being wrap'd up in Fat, will ſlip out from under the Point of your Lancet.

Nay if the Party that holds the Candle happens to move it at that very Inſtant when the Lancet enters, or that the Patient out of Fear pulls back his Arm at that very Inſtant of Time, this is ſufficient to make the Chirurgeon miſtake; and tho' this does not happen thro' any Fault of his, 'tis nevertheleſs moſt commonly laid at his Door.

If an *Enchymoſis* ariſes about the Orifice made by the Launcet, if the Blood ſettles and produces a ſmall Abſceſs, which ends in a Suppuration after Bleeding, 'tis doubtleſs the Patient's own Fault, who by making Uſe of his Arm too ſoon, by this Action makes the Blood to iſſue out of the Vein, which not being able to go further by Reaſon of the Bandage, extravaſates and ſettles betwixt the Skin and the Vein.

Thus I remember it happened not many Years ago to a Waiting-woman of a Lady of the Firſt Quality, whom I let Blood in the Morning; but being unwilling her Lady ſhould know any Thing of it, combed her Head within an Hour after; but ſoon after being ſeiſed with a violent Pain in that Part where Phlebotomy was adminiſtred, ſhe ſent for me, ſo that I ſaw my ſelf obliged to tell her Lady that ſhe had been blooded.

The Fore-Arm is as it were wrapped up within a very large *Aponeuroſis*, which hitherto has been miſtaken for the *Membrana Communis* of the Muſcles. When a Chirurgeon ſees himſelf reduced to a Neceſſity of opening a Median Vein, which lies very

forward, 'tis next to an Impoſſibility to avoid touching upon this *Aponeuroſis*, which when you do, you will feel it ſometimes to your Fingers Ends, and therefore you muſt avoid thoſe Sorts of Venæſections as much as poſſibly you can. But if it happens ſo that you cannot let Blood in any other Place, and that you have prick'd this Membrane, it will be accompanied with a Defluxion, Pain, and ſometimes with an Abſceſs, to the great Mortification of the Chirurgeon. For though theſe Accidents do not happen by any Fault or Defect in the Chirurgeon, 'tis nevertheleſs his Buſineſs to take Care of it, and prevent any ill Conſequences that may ariſe.

If it be a ſimple *Enchymoſis*, you may cure it by bathing it with *Aqua Vitæ*, or Spirit of Wine; but if there be ſome Blood that will go into a Suppuration, you muſt give it a helping Hand with the *Empl. de Vin.* mix'd with a little *Baſilicon*; and as ſoon as the *Pus* is diſcharged through the Place where the Phlebotomy was adminiſtred, you may dry it up with an Emplaiſter of burnt Cerule.

If it be a Defluxion upon the fore Arm, occaſion'd by the Pricking of the *Aponeuroſis*, you muſt let Blood frequently in the other Arm, by Way of Revulſion, to turn the Humour that is apt to fall upon that Part another Way. You muſt alſo embrocate the affected Part with Oil of Roſes, Camomil, Melilot of Earth-Worms, and apply Anodyne and diſſolvent Cataplaſms.

Sometimes it happens, that though the Operation of Phlebotomy be never ſo well performed there will be a Defluxion upon the Arm where it has been adminiſtred. This moſt commonly happens to cacochymical Bodies, who being over-charged with ill Humours, theſe are always ready to fall upon any Part.

When Venæſection is adminiſtred to ſuch Conſtitutions, theſe Humours are very apt to fall upon the Part that is moſt exhauſted by Phlebotomy. The next Day after, you will find the Arm very painful, and very much ſwell'd, and will be ſo to a great Exceſs, unleſs you prevent it by turning the Current another Way, *viz.* by plentifully bleeding in the oppoſite Arm, by Cordials taken inwardly, and by the Application of ſuch Remedies as are capable to check and ſtop the Courſe of the Humours, to diſſolve them, and to fortify and ſtrengthen the Arm againſt thoſe that are fallen that Way already.

Theſe Humours are ſometimes ſo furious, and of ſo malignant a Nature, that I have known a Gangrene enſue on the Second Day, and the Patient died on the Third.

Such a Misfortune happened to befal a Lady, the Wife of a certain Gentleman belonging to the Queen's Court, who being much afflicted at the Death of an only Son of hers, fell very ill, and I was ordered to let her Blood the next Day: But before that Time ſhe changed her Mind, and would needs go to a Country-Houſe of her Husband's near *Verſailles*, where ſhe was let Blood in the Foot: But ſo violent a Defluxion did fall upon her Thigh and Leg, as produced a Gangrene, and ſhe died in Three Days after.

About a few Months ſince, the Duke *de St. Simon* was let Blood by One of the moſt noted Chirurgeons of *Paris*, in the Arm, and followed by a violent Defluxion upon the Part, occaſion'd by his preſent ill Diſpoſition of Body, which terminating in an Abſceſs, was open'd, and cured in Three Weeks Time, without leaving any Lameneſs behind.

In this Operation, the Fault was laid at the Door of the Chirurgeon by every Body that heard of it. Nothing would ſerve but that he had prick'd either a Tendon or a Nerve; but the Event did ſufficiently juſtify the Chirurgeon by the ſpeedy Cure, that neither of thoſe before-mention'd Two Parts could be wounded; for you may take this for a general Rule, That whenever they are, it will require ſome Months to accompliſh their Cure.

But in caſe it happens, That a Chirurgeon does unfortunately prick a Tendon or a Nerve, neither of them are mortal, provided the Chirurgeon hath timely Recourſe to ſuch Remedies as are preſcribed by our Art. And that a young Chirurgeon may not be at a Loſs in ſuch a Caſe, I judge I can give him no better Directions or Inſtructions than what may be taken from the Hiſtory of King *Charles* IX. (of *France*) unto whom happen'd this Misfortune: Of

this, I will give you an Account in the very Words of *Ambroſius Paraeus*, the ſaid King's chief Chirurgeon, and one of the moſt celebrated Authors in Chirurgery of our Nation, as he has thought fit to leave it us in Writing.

'The King being ſeized with a Fever, 'Monſieur *Chapelain* his chief Phyſician, 'and Monſieur *Caſtellan* another of his 'Phyſicians, and chief Phyſician to the 'Queen-Mother, did order him to be let 'Blood. A Chirurgeon of great Reputa-'tion was call'd to perform the Operation, 'who as he was endeavouring to open a 'Vein, he prick'd the Nerve, and the King 'cried out immediately, and ſaid that he 'felt it exceſſive painful. I cried out aloud 'at that very Inſtant to looſen the Ligature, 'for that elſe the Arm would ſwell moſt 'exceſſively, which happen'd ſoon after, 'with a Contraction of the Arm, in ſuch 'a Manner, that he was not able either to 'bend or to extend it freely; but felt an 'exceſſive Pain, as well in the Part where 'the Punction had been made, as all over 'the whole Arm. I applied a ſmall Em-'plaiſter of *Baſilicon*, being the firſt and the 'next Remedy I had at hand, leſt the 'Wound ſhould agglutinate; and all over 'the Arm, Compreſſes ſoak'd in Oxicrate, 'with an expulſive Ligature, beginning at 'the Wriſt, and ending near the Shoulder, 'in order to ſend back the Blood and Spi-'rits towards the Center of the Body, leſt 'the Muſcles ſhould be affected with an 'exceſſive Defluxion, Inflammation, and 'other Symptoms. This being done, we 'went together into a Room, to conſult 'what Remedies were moſt proper to allay 'the Pain, and obviate ſuch other Sym-'ptoms as will moſt commonly be the Conſe-'quences of the Punction of a Nerve. I 'propoſed, that ſome Oil of Turpentine, 'mix'd with ſome little high-rectified *Aqua 'Vitæ*, ſhould be applied very hot within 'the Punction, and to the whole Arm 'an Emplaiſter *Deiachalciteos*, diſſolved in 'Vinegar and Oil of Roſes, and to conti-'nue the above-mentioned expulſive Liga-'ture.

'My Reaſons were, That the ſaid Oil 'and *Aqua Vitæ* have a Power or Vertue to 'penetrate to the very Bottom of the Punc-'tion, and to dry up the Moiſture that 'comes from the Subſtance of the Nerve, 'and to appeaſe the Pain, both by their 'actual and potential Heat; and that the 'beforeſaid Empl. *Diachalciteos* was like-'wiſe endued with a Vertue to diſſolve the 'Humour that was ſettled already in the 'Arm, as well as the Defluxion of any 'other hereafter. As for the Ligature, I 'told them it would corroborate and reſtrain 'the Muſcles, expreſs and repel the Hu-'mour fallen already upon the affected 'Part toward the ſuperior Parts, and pre-'vent freſh Defluxions: All which being 'approved of by the Phyſicians, we una-'nimouſly agreed upon the beforeſaid Reme-'dies as uſeful and neceſſary for the preſent 'Caſe. By the Application of them, the 'Pain ceaſed; and to facilitate the Diſſolu-'tion of the Humours contained in the 'Part, we applied ſoon after Diſſolvents 'and Deſiccatives: As for Inſtance;

'*Far. Hord. & Orob. ana Unc. ij. Flor. Ca-'momill. & Melilot. ana Pug. ij.* freſh unſal-'ted Butter, *Unc. j. ß.* of Waſhballs, ſuch 'as the Barbers uſe, as much as is ſufficient 'to bring it to the full Conſiſtency of a 'Cataplaſm.

'By the Uſe of theſe Remedies, and 'God's Mercy, the King was perfectly well 'cured, without the leaſt Remnants of this 'Accident, or the leaſt vicious Diſpoſition 'in the Functions of the affected Part; 'though it was above Three Months before 'he had the right Uſe, I mean of Flexion 'and Extenſion of his Arm.

If by Misfortune a Chirurgeon happens to open an Artery inſtead of a Vein, or perhaps both at once, which will ſoon diſcover it ſelf by the impetuous ſpouting out of the Blood, he muſt not deſpair upon that Account, and betray his Surpriſe either to the Patient or the Standers by, becauſe it is impoſſible to help it by ſtanding amazed in a Caſe which requires rather a Preſence of Mind to help it.

For the Satisfaction and Inſtruction of the young Chirurgeons, I will here give you an Account of what happened one Time to my

my Maſter, with whom I ſerved my Apprenticeſhip, upon ſuch-like an Occaſion. I remember he was ſent for to bleed a certain Penſioner at the College of *Harcourt*, and took me along with him to hold the Candle whilſt he was performing the Operation. Inſtead of opening the Vein, he prick'd the Artery, ſo that the Blood flew out with great Impetuoſity, and a high Spout quite beyond the other Side of the Bed, and in the Diſh there aroſe abundance of Froth of a Vermilion inclining to an Orange-Colour.

He ſoon perceived that he had prick'd an Artery; but was ſo far from being amazed thereat, that with a great Preſence of Mind he told the Patient, that his Blood being exceſſive hot, it would be requiſite he ſhould take away a conſiderable Quantity of it, to cool and allay that exceſſive Heat, which elſe might prove of dangerous Conſequence in a very ſhort Time; ſo without more ado he ask'd for a Second Diſh, and let the Blood run till he found the Patient ready to ſwoon away; for as the Patient grew weaker and weaker, the Spout of the Blood grew leſs, and lower and lower; ſo that no ſooner had he taken off the Ligature, but the Patient fell into an abſolute Swoon, and the Bleeding ceaſed.

He made uſe of this Nick of Time, without a Moment's Delay, to apply the Compreſs and Band to the Arm, which he made much ſtreighter than is uſually done; and inſtead of one made uſe of a double Band, for the greater Security of the Arm, which he immediately bent, laid cloſe and faſten'd to the Patient's Waſtcoat upon the Stomach, leſt when he began to ſtir himſelf he ſhould extend it, and occaſion freſh Bleeding. This done, he clapp'd ſome Water into his Face, held a Vinegar-Bottle to his Noſe, till he recover'd him out of his Swoon. He then took care to have the Blood thrown away; and giving a great Charge to the Patient not in the leaſt to ſtir his Arm, becauſe, ſaid he, your Blood is in ſuch a Ferment and Heat, that in caſe the Dreſſing ſhould open, he would infallibly bleed to Death before any Body could be call'd to his Aſſiſtance.

Towards Evening he went to ſee how it was with his Patient, under Pretence that he happen'd to come that Way to viſit another Patient of his hard by; and finding that the Patient had been very obſervant in keeping his Arm bent as he had placed it, he was pretty well ſatisfied for that Time. But the next Day, when he came to give a Viſit a Second Time to this Patient, he made heavy Complaints that his Arm was too ſtreight bound up; but he told him there was an abſolute Neceſſity of keeping it on juſt as it was till the Third Day; in which the Patient did acquieſce. Then the Firſt Bandage being taken off, he put on another Compreſs and Band, for its greater Security. Thus the Orifice of the Artery cicatrized in the ſame Manner as if it had been a Vein; and the Patient all this while thought he had been bled as well as ever he was in his Life, becauſe the Chirurgeon took care to keep him in Ignorance.

I will conclude this Article of Bleeding in the Arm with a remarkable Story that happen'd not many Years ſince, which will ſerve as a Pattern to judge of the Ignorance and Impudence of thoſe that declare open War againſt Phlebotomy.

This was one *Dancaſcen*, a Perſon well made, and always well clad, and who had a ſufficient Share of Aſſurance in all his Actions, to ſay no more of him. This Pretender declared open War againſt Venæſection in General, ſaying it was no better than Murthering a Man to take from him the Treaſure of Life. He told his Patients, that all the Diſeaſes were govern'd by the Moon, and ſo muſt their Cures be likewiſe; and he had certain Opiates, Antidotes, and Elixirs, which he order'd to be taken at certain Times of the Moon; and with theſe he pretended to cure all Diſeaſes, without Exception. And to crown the Matter, he printed a Tract, wherein he attempted to maintain his Aſſertions as undoubted Truths.

He had the Aſſurance to attend the King at Dinner, and the Queen alſo at Supper, where he told them moſt miraculous Stories concerning his Cures. But it happening one Day that a young Apothecary was by when he made his Boaſts, he told the Queen, That knowing the Fellow to be an ignorant Mountebank, he could not hear him impoſe thus upon her Majeſty, for that he had ſeen him

him upon a Mountebank's Stage at *Reunes* and *Nantes*, and that he was certain he did not as much as know thoſe Plants by Sight, the Preparation of which he had ſo much boaſted of. To make good what he had told the Queen, he went immediately into an adjacent Wood, gathered there Seven or Eight of the before-mention'd Herbs, which being ſhewn to the Mountebank in the Preſence of the Queen, he could not ſo much as name any one of them.

Several Perſons of Note who had entruſted themſelves into his Hands, finding themſelves much deceived in the Event, the King order'd him to be baniſh'd the Court for ever, which was done accordingly, after he had play'd his Game there for about Four Months.

How VENÆSECTION *is to be adminiſtred in the* FOOT. *By the ſame Author.*

THE Firſt Thing wherein Bleeding in the Foot differs from that in the Arm, is the Time when it is to be adminiſtred, *viz.* that of the Arm in the Morning, and in the Foot in the Evening: Beſides that, the Firſt requires Reſt, but the Second Exerciſe, before its being adminiſtred. However, this is to be underſtood when you are at Liberty to chooſe your Time; for in Caſes of urgent Neceſſity either of them may be done, without Exception, at any Hour of the Day or Night.

'Tis not without good Reaſon, that moſt commonly we let Blood in the Arm in the Morning, it being the moſt proper Time, becauſe the Blood circulating more freely, and without any Impediment, whilſt we are in Bed, the Veins are apt to ſwell the more, and conſequently the Blood will ſpring forth with the more Vigour and Vivacity when the Vein is open'd.

For this Reaſon it is alſo, that it is more convenient to bleed in Bed than after the Patient is riſen, becauſe the Heat of the Bed facilitates the Bleeding much better than after the Blood is cooled in riſing out of Bed: Whereas on the contrary, when Venæſection is to be adminiſtred in the Foot, 'tis good to walk, that thereby the Blood being carried more downwards, the Veins may ſwell and appear the better, and the Blood may follow more plentifully than if the Patient had uſed no Exerciſe before.

This is proved by daily Experience, for when we undreſs our ſelves, and pull off our Stockings at Night, it is apparent, that the Veins in the Feet are more ſwell'd and conſpicuous than in the Morning when we riſe out of the Bed.

The Phlebotomy in the Arm and Foot do differ likewiſe in the Manner of adminiſting them. We always let Blood in the Foot in warm Water, which is not practiſed in that of the Arm. The Deſign of the warm Water is to make the Veins of the Foot ſwell the better, which being at a greater Diſtance from the Heart, are conſequently not ſo large as thoſe of the Arm: Juſt as we ſee it in the Branches of Trees, which, the nearer they are to the Stem or Trunk, the bigger they are; and the more remote they are from it, the leſſer they grow by degrees: And upon this Account it is, that we make uſe of warm Water in the Phlebotomy of the Foot, *viz.* to ſupply this Defect, and render the Veins the more conſpicuous.

So ſoon therefore as the Chirurgeon enters the Room where the Patient is, he muſt order ſome Water to be heated, unleſs he finds it ready done to his Hands before; and whilſt the Water is over the Fire, he muſt take Care of a convenient Veſſel wherein to adminiſter the Venæſection in the Foot. At the Bottom of it he muſt lay a Napkin, that the Feet may not touch the Bottom of the Veſſel, which is moſt commonly either of Wood or Copper, and ſhaped like a Pail or Kettle. You may alſo expand another Napkin over the Veſſel, to ſtrain or pour the hot Water through it into the Veſſel, for fear ſome Impurities ſhould be fallen into the Water whilſt it was over the Fire. But you muſt not bleed in the Foot in the

ſame

ſame Veſſel wherein the Water has been heated, for fear of burning the Patient's Legs or Feet.

The moſt convenient Veſſels for this Operation, are thoſe, which the Ladies make uſe of to waſh their Feet in; for, beſides that theſe are always kept very clean and neat, and that conſequently there is no Occaſion for a Napkin at the Bottom, they are very deep, ſo that you may keep your Legs in the Water as far as above the Calf.

So ſoon as the Water is poured out of the Kettle into the Veſſel, the Chirurgeon ought to be ſatisfied that it is neither too hot nor too cold, yet ſo as to let it rather be a little too hot, than too cold; becauſe it is apt to cool before the Patient puts his Legs into it, and in caſe it proves a little too hot, a little cold Water will qualify it exactly for your Mind and Purpoſe.

Tho' Phlebotomy is adminiſtred only in one Foot, you muſt let the Patient put both his Legs into the Water, and that upon a Threefold Account: *Firſt*, Becauſe it is much more eaſy and convenient for the Patient to hold both his Legs in the Water, than one alone. *Secondly*, Becauſe the Blood is much more apt to deſcend towards the inferior Extremities when both of them are thus heated, than when there is only one. And, *Thirdly*, Becauſe if it ſhould ſo happen, that the Chirurgeon ſhould find it too difficult to adminiſter *Venæſection* in one Foot, the other is ready at Hand for the ſame Operation; and conſequently, he may chooſe either of the Two Feet, which of them he finds eaſieſt to be let Blood in, without being at the Trouble of putting the other Foot in the warm Water, and ſtay for its being warmed ſufficiently.

Tis a vulgar Error to imagine, That in certain Diſeaſes it is much more expedient to let Blood in one Foot than in the other.

That large Artery which receives the Blood from the Heart, and afterwards conveys it through the whole Machine of the humane Body, is divided above the *Os Sacrum* into Two large Branches, which take their Paſſage through the Thighs and Legs; ſo that the Blood of either Foot being derived from the ſame Head Spring, it is indifferent in what Foot you let Blood.

And therefore, when a Patient aſks his Phyſician in what Foot he muſt be let Blood, he will doubtleſs, or at leſt ought to tell him, In that Foot which the Chirurgeon thinks beſt. For if ſo it happen, that he meets with much Difficulty, or perhaps an Impoſſibility, of Bleeding in that Foot where the Phyſician has ordered the Vein to be opened, the Patient will not permit him to bleed in the other Foot; or if he, overperſuaded by the Chirurgeon, at laſt conſents to it, it is not without much Reluctancy: And in caſe, after Phlebotomy is adminiſtred in the other Foot, he does not reap all the Benefit he expected by it, he will be ſure to lay the Fault upon the Chirurgeon's having bled in the wrong Foot; Whereas it often happens, that when the Chirurgeon is confined to make this Operation in one Foot only, the Blood will at leaſt not follow ſo freely, and in a ſufficient Quantity, by Reaſon of the Smallneſs of the Veins; whereas, had the Chirurgeon been left to his Liberty to chooſe in which Foot he found the Veins the largeſt, the Venæſection would have ſucceeded much better, and proved more beneficial to the Patient.

After the Patient has put his Feet in the Water, let him hold them there for ſome Time, that the Blood may be well heated; and in the mean while, the Chirurgeon muſt order ſome more Water to be heated, that in caſe it ſhould take up ſome conſiderable Time before he can find out the Vein, or that the Patient would not ſuffer the Water to be ſo hot as it ought to be, he may have at Hand a freſh Supply of hot Water.

The Chirurgeon muſt ſeat himſelf directly oppoſite to the Patient, and having put a Napkin doubled ſeveral Times together upon his Knees, he rubs the Patient's Legs downwards, to facilitate the Deſcent of the Blood towards the Foot.

The Chirurgeon judging the Veins to be ſufficiently ſwelled, he takes the Foot in which the Venæſection is to be adminiſtred out of the Water, and lays it upon his Left Knee, if it be the Right Foot he is to bleed in; or elſe upon his Right Knee, if it be the Left Foot: He dries it with the Linnen Cloth that lies upon his Knees, and after this,

this applies the Ligature, *B.* about Two Fingers Breadth above the Ankles, yet ſo as not to be too much ſtreighten'd. He muſt make Two circular Circumvolutions, as in the Arm, and tie it in a Knot towards the outer Ankle; and then having made Trial with his Fingers, whether he can well diſcover the Veins, he orders the Patient to put in and keep the Foot for ſome Time longer in the Water.

When I treated before of the Venæſection in the Arm, I told you that the Ligature ſhould be of Woollen Cloth; but that to be made uſe of in Bleeding in the Foot, muſt be of Silk, or ſome ſtrong Linen Cloth, of a red Colour, becauſe a Woollen Ligature when it becomes wet will give way, which this laſt will not do: Beſides that, when a Ligature made of Woollen Cloth comes to be too much ſtreighten'd, it will break, and retard the Operation, whilſt you are to ſeek for another Ligature.

Whilſt the Patient is holding his Foot thus in the Water a Second Time, the Veins ſwell more and more; and then the Chirurgeon muſt get ready his Lancet, *C.* and put it in his Mouth, as directed before in the Bleeding in the Arm.

Then he takes out the Foot a Second Time, lays it upon his Knee, and ſtreightens the Ligature ſtill more than before, in order to keep the Skin and Vein more ſteady and firm. Then after having taken the ſame Precautions concerning the Light as we ſaid before, he puts it to the beſt Advantage, either on the Outſide or Inſide of the Foot, and having very well examined the Veins, he pitches upon that which is moſt conſpicuous and apparent, and this is moſt commonly the Vein call'd the *Saphena*, which he opens either above or below the Ankle; but muſt take care not to thruſt in his Lancet too deep, for fear of pricking the *Periofteum*, which is at no great Diſtance from the Vein in this Place.

The Vein being open'd, the Patient muſt put the Foot into the Water again; and if you think the Ligature too much ſtreighten'd, you may looſen it a little; but if you perceive the Blood to come freely and plentifully, you muſt let it alone, it being a certain Sign that it is not too ſtreight. Let the Blood come away till you judge you have taken away ſuch a Quantity of it as has been order'd by the Phyſician; and this you may judge by the Time whilſt it was coming from the Vein; by the Colour of the Water, according as it participates leſs or more of a red Colour, which you may diſcover beſt by putting of a Corner of a Napkin into it, where it will leave a Tincture behind.

Towards the latter End you will obſerve certain Filaments or Fibres of the Blood ſwimming upon the Surface of the Water, the red Tincture of which being extracted by the Water, will ſtick to the Patient's Legs. When the Chirurgeon obſerves theſe to appear, he may take it for a certain Sign that there is a ſufficient Quantity of Blood taken away, at leaſt, as much as will fill up Three ſmall Porringers. Then it is Time to take off the Ligature; but you may let the Foot ſtill remain for ſome ſmall Time in the Water, the better to diſcharge the Vein.

After you have taken the Foot out of the Water, and well dried it, you may apply to the Orifice of the Vein that has been open'd a ſquare pretty thick Compreſs, *E.* and with the Band, *F.* which muſt be ſomewhat longer than that uſed after Bleeding in the Arm, make a Bandage, which is known by the Name of the *Stirrop*, becauſe it is made like it, being ſuch as is mark'd with *G.*

After this, you muſt take care to dry well the other Leg and Foot alſo, lay the Patient into a good warm Bed, and give him a Glaſs of *Aqua Vitæ* immediately after the Bleeding is over.

The Blood muſt not be thrown away, but kept, that the Phyſician, the next Time he comes to ſee the Patient, may judge of its Quality, as well as of the Quantity that has been taken away.

If your Patient be addicted to the Opinion of Sympathy, you may put ſome cold Water, to the Blood; for if, according to the Rules of Sympathy, the Blood that is remaining behind in the Veins, may be put into a Heat by its being mix'd with hot Water, by the ſame Rule the ſame Blood of a

Patient that has been let Blood, may be refreſhed by the Effuſion of cold Water with that which has been taken away.

But let the Thing be as it will, it is an eaſie Matter to humour Patients in ſuch trifling Things, and to flatter their Imaginations where there is neither Danger nor Harm.

When you have done all, you wipe your Lancet on the Cloth, and take your Leave.

I conclude this Article of Bleeding in the Foot with giving a Caution how they adminiſter it to ſome Women, which in effect they ought not to do without the previous Order of a Phyſician; for nothing is more common among Women than to ſend for a Chirurgeon to be let Blood in the Foot, under Pretence of a Suppreſſion of their Monthly Terms, or ſome other Diſeaſe, but in Effect to procure an Abortion: And therefore a young Chirurgeon ought to be upon his Guard in this Point, that he may not bear the Blame of what is not his own Fault: And this he can avoid no better than by not venturing upon any of theſe Phlebotomies, without the previous Order of a Phyſician.

Of the PHLEBOTOMY *and* ARTERIOTOMY *adminiſtred on the* HEAD. *From the ſame Author.*

IT is no leſs natural than cuſtomary to take more Care of ones Face than of any other Part of the Body: But after all, we ſee our ſelves ſometimes neceſſitated to ſubmit even this tender and moſt beautiful Part to the Chirurgical Operations, when divers Diſeaſes which afflict us challenge the Aid of Bleeding in the Face.

For here it is that we not only open certain Veins as in other Parts, but alſo ſome Arteries. Of the *Firſt* there are Four, *viz.* the *Vena Præparata*, the *Angularis*, the Vein of the Noſe, and the *Ranulæ*: And of the *Second* there are Two, *viz.* the Artery of the *Temples*, and of the *Ears*.

In the middle Part of the *Frons* you ſee a certain Vein, which is call'd the *Præparata*, deſcending in a ſtreight Line from the *Sutura Sagittalis* to the middle Part of the Interſtice betwixt the Eye-Brows. It receives the Blood that has paſs'd through the anterior Part of the Head, and carries it downwards to the *external Jugulars*, from whence it is convey'd further into the *Subclaviæ*, and ſo through the *Vena Cava Deſcendens* to the Heart. 'Tis the ſame large Vein which appears ſo much tumefied when People are in an exceſſive Paſſion, and is much more conſpicuous in Perſons of a reſolute and obſtinate Temper than in others.

In caſe this Vein has been ordered to be open'd by a Phyſician, 'tis the Chirurgeon's Buſineſs to put it in Execution; and for this Purpoſe he muſt apply a Bandage about the Neck, of a Handkerchief twiſted together, *A.* not unlike unto that we ſhall have Occaſion to deſcribe to you anon in the *Venæſection* of the Jugular Veins; but take Care to apply it ſo, that it may not preſs or bear too hard upon the Wind-Pipe. You muſt have ready at hand a Band, *B.* and a Compreſs, *C.* both of the ſame Bigneſs with thoſe commonly made uſe of in the *Veneſections* of the Arm. Neither is there any Difference betwixt the Lancet wherewith you are to open this Vein, and that which opens thoſe in the other Parts. So ſoon as you find the Vein ſufficiently tumefied, make a quick Inciſion; for 'tis not expedient to keep the Throat ſo much ſtreighten'd, or at leaſt no longer than needs muſt be.

You muſt not make this Inciſion by plunging the Lancet into the Vein, for fear of pricking the *Pericranium*, which lies immediately and directly under this Vein; but you muſt make the Orifice a little oblique; and ſo ſoon as you find the Point of the Lancet has enter'd into the Vein, you muſt make an Elevation with your Inſtrument, ſo as to cut or divide a little more of the Skin than of the Vein.

So ſoon as the Vein is open'd, you muſt looſen the Ligature a little, to eaſe the Patient in Reſpiration; but you muſt not undo it too much, for if you do, the Blood will not follow any more. When you think

think you have taken away as much Blood as you ought to do, you quite remove the Ligature from the Neck, and the Bleeding will ceaſe immediately, becauſe now its Paſſage to the Heart is free and uninterrupted.

You may apply a Compreſs to the Orifice, and a Band over it. You muſt wind the Band round the Head; but you may take it off again the next Day, becauſe of all the Openings made by *Venæſection*, this is ſooneſt healed up.

The *Phlebotomy* which is adminiſtred in the *Vena Angularis* is ſubject to no leſs Difficulty than the former. This Vein has obtained its Denomination from its Situation in the great Angle of the Eye, being the ſame Vein that is conſpicuous betwixt the Angle of the Eye and the Noſe. It receives the Blood after it has been carried to and paſs'd through the Balls of the Eyes, and the adjacent Parts; for which Reaſon it is, that theſe Veins are order'd to be open'd in the Diſeaſes, and more particularly in the Inflammations of the Eyes, to diſcharge the Blood wherewith theſe ſmall Veins are over-ſtock'd from the next adjacent Part.

You muſt be provided with a Band, *E.* of about Two Yards long, in order to make ſeveral Circumvolutions about the Head, which muſt be narrower than is commonly practiſed in other Venæſections, ſo as not quite to cover and prove troubleſom to the Eyes. The Compreſs, *F.* muſt be of a triangular Figure, and adapted to the Figure of the Part. It muſt be pretty thick alſo, to fill up the Cavity of the Angle of the Eye.

The Patient muſt be placed in a ſitting Poſture, and the Ligature muſt be made in the ſame Manner as in the Phlebotomy of the *Vena Preparata*, or the Front. You muſt direct the Patient to ſhut his Eyes, and ſo ſoon as you ſee the Vein ſufficiently ſwell'd, you may open it with the Point of your Lancet, without the leaſt Fear of its ſlipping from under your Inſtrument, becauſe this Vein lies immoveable. However be careful not to prick either the *Perioſteum*, or the *Cartilago Angularis* of the Eye, it being very near it.

So ſoon as the Vein is open'd, let the Patient hold or bend his Head downwards, that ſo the Blood may fall the eaſier into the ſmall Porringer without running down along the Face, which it would infallibly do, in caſe the Patient ſhould hold his Head ſtreight upright, becauſe the Blood never ſprings out like from a Spout from this Vein.

When you have taken away a ſufficient Quantity of Blood, you muſt remove the Ligature, wipe and cleanſe the Face of the Blood, and apply the Compreſs to the Orifice. And of the Band, you muſt put the Firſt End of it under the Ear, on the ſame Side where the Opening is made, and aſcending above the Cheek, it runs over the Compreſs, and then paſſing ſlopewiſe over the Front, it is turn'd over the back Part of the Head, under the ſame Ear as before; and thus you make as many Circumvolutions as the Length of the Band will admit of. Then you faſten it with a Pin in that Place where it terminates, and leave it thus for a Day or Two, according as the Patient deſires it, or according as there is more or leſs Fear of the Blood's ſpringing out again.

Betwixt the Two Cartilages that form the ſmall Globe of the Noſe there lies a Vein, which, though not conſpicuous on the Outſide, yet is ſometimes ordered to be opened in certain Diſeaſes. However it happens but ſeldom; for the Vein being very ſmall, furniſhes but a ſmall Quantity of Blood, and conſequently produces no extraordinary Effects: However, when this Vein is to be open'd, you muſt proceed in the following Manner.

You muſt make a ſtreight Ligature about the Patient's Neck, as much as is requiſite to tumefy the Veins of the Head: Then take a Lancet, wrap'd up in a ſmall Piece of Linen Cloth, from the Middle of the Handle to the middle Part of the Blade; which is done, as well to know and be ſure of the true Depth how far the Lancet is to enter, as to keep or hold it the more ſteady and firm. Then pinch the Noſe together with the Thumb and *Index* of the Left Hand, ſo as to hold the reſt before the Patient's Eyes (to prevent his being frighten'd with the Sight of the Lancet). You muſt plunge your Inſtrument with the Right Hand lengthways in betwixt the Two Cartilages, with the Point turn'd upwards. You muſt thruſt it in till you ſee the Blood coming

out on the Side of the Lancet, or as far as to the Linen; for you muſt not pretend to go beyond that Mark, even though you have not reach'd the Veins, which will happen very often in this Venæſection, which at the beſt is made at Hap-hazard.

But if by good Fortune you have hit the Vein, let the Patient bend his Head forwards, that the Blood, which ſometimes comes in a ſmall Thread, ſometimes Drop by Drop, may be received the better in the Porringer. So ſoon as the Ligature about the Neck is looſen'd, the Blood ceaſes to follow: However, you may apply a ſmall Compreſs, *H.* and a Band, *I.* cut through about the Place where the Noſtrils are. This Band has Four Chiefs, or Ends, which you muſt faſten with Pins to the Night-Cap.

I would adviſe the young Chirurgeon, before he ventures upon this Operation, to tell the Patient and Standers-by beforehand, that he being to undertake this Venæſection at Hazard, he could not anſwer for the Succeſs, and that therefore they ought not to be ſurpriſed if the Blood does not follow.

The Fourth Sort of Phlebotomy in the Face is adminiſtred in the *Ranulæ*. Theſe are Two Veins ſituated under the Tongue, on the Sides of the *Bridle*, *viz.* one on the Left, and the other on the Right Side of it.

This Vein, after having received the Blood that paſſes through and nouriſhes all the Parts belonging to the *Baſis* of the Tongue, diſcharges it into the Jugular Veins.

Venæſection is much more practiſed in theſe than in the preceding Veins, becauſe there is more frequent Occaſion for them; foraſmuch as the Patients reap more conſiderable Advantages from it in divers Diſeaſes, but eſpecially in the *Quinſey*, a Diſtemper which is very common among us.

Here you need not make any Preparations of Band or Compreſs, becauſe you have Occaſion for neither of them, but only for a Lancet, which muſt be wrap'd up in a Piece of Linen Cloth, ſo as to have the Point only bare. About the Neck you muſt make the uſual Ligature, as has been preſcribed before, to further the Tumefaction of the Veins: Then you muſt order your Patient to open his Mouth; and raiſe up his Tongue cloſe to the Palate, where you will without much Difficulty diſcover the Veins, they being ſituated at the Surface.

You muſt with the Lancet, *G.* open one of thoſe Veins, and immediately after, almoſt at the ſame Inſtant, the other likewiſe, before the Patient has Time to let his Tongue come down. Then let him bend his Head forward, ſo that the Blood may run out of his Mouth into ſome Veſſel held underneath for that Purpoſe, that thereby you may judge the better of the Quantity of the Blood that is taken away.

'Tis very requiſite both the *Ranulæ* ſhould be open'd at the ſame Time, for being none of the largeſt, one alone would not be able to furniſh a ſufficient Quantity of Blood, as is neceſſary to be evacuated in Quinſies, where the Patient is in imminent Danger of being ſtrangled by the vaſt Quantity of Blood which falls upon the Throat.

So ſoon as you have removed the Ligature from the Neck, the Blood will ceaſe to flow any longer; and when the Patient has raiſed his Head again in an erect Poſture, let him waſh his Mouth with Oxecrate, and afterwards with warm Wine, which will infallibly ſtop the Bleeding; and if by Chance a few Drops ſhould come forth afterwards, he need only draw his Tongue downwards, and keep it in that Poſition, without moving it either one Way or other.

Of the ARTERIOTOMY, *or Opening of an* ARTERY. *By the ſame Author.*

THE *Arteriotomy* is adminiſtred to no other Part of the Body but to the Head. This Word has its Derivation from *Arteria*, *i. e.* an *Artery*, and *Temnin*, *i. e.* to cut aſunder, or diſſect, becauſe this Operation conſiſts in the Opening of an Artery, to draw from it ſome of the Blood contained in it.

The Reaſon why this Operation is adminiſtred to the Head only, and not to any other Part of the Body, is becauſe the Skull being

being a harder Body, ſituated under the Artery, you may by making a ſtreight Compreſſion, by the Means of a Compreſs and Band, ſtop the Bleeding without much Difficulty; which would not ſucceed thus in the other Parts of our Body, where the fleſhy Parts are incapable of making the ſame Reſiſtance as the Skull does here.

The Artery is open'd in Two Places, *viz.* in the Temples, as likewiſe a little lower near the Ears, very near that Prominency call'd the *Hirtus*, from the Hairs that grow there.

A Chirurgeon muſt not pretend to venture upon theſe Sorts of Bleeding upon his own Head, or at Random: It is requiſite he ſhould not attempt them without the previous Order of a Phyſician, or elſe when the Caſe is ſo urgent, that there is no other Way left of ſaving the Patient's Life, as in an Apoplexy, and where Venæſections will not take Place, or be of any Benefit to the Patient.

Here the Ligatures which are applied to cauſe a Tumefaction of the Veins, would rather hinder than promote the free Paſſage of the Blood into the Artery, and therefore are uſeleſs here. You have nothing to do in this Reſpect here but only to enjoin your Patient to hold his Head lower than any other Part of the Body, that ſo the Blood may the eaſier be determined and carried that Way.

You make uſe of the ſame Sort of Lancets as in the Venæſections of the Arm, which you muſt put in your Mouth half open; and after you have diſcovered the Artery, with the Help of your Fingers, by its Pulſation, and mark'd the Place which you think moſt proper for your Purpoſe with One of your Nails, you open the Artery, by making a Punction and Elevation, as is cuſtomary in Phlebotomy, and the Blood will come forth with Violence like from a Spout.

In this Caſe you commonly take away more Blood at once than is generally done in Venæſections, if the Strength of the Patient will permit it; and when you are to ſtop the Efflux of the Blood, in order to do it with the more Security, you may apply a Bean ſplit in Two, ſo that the flattiſh Part be applied to the Artery, over this the Compreſs, *L.* and over this the Band, *M.* which muſt be brought round the Head, and made ſomewhat ſtreighter than ordinary.

For Want of ſuch a Bean, you may put a Farthing within the Doubling of the Compreſs; ſo that the Artery being kept flat betwixt Two hard Bodies, the Blood is forced to take another Courſe; and in the mean while the Artery will conſolidate like a Vein, provided you leave it thus done up cloſe for Three or Four Days together.

The Band muſt be made in the Figure of a T, ſo that that Branch which is carried over the Head, may keep the circular Circumvolutions from ſlipping out of their Place.

The *Arteriotomy* is an Operation which is but ſeldom made uſe of, and (as I ſaid before) not but in Caſes of Extremity. I remember, that when (in the Year 1681.) I was at *Liſle* in *Flanders*, where the King and Court then were, I was ordered by ſome of the Phyſicians that attended the Court to open an Artery to One of the Officers belonging to the Marſhal *d'Humieres*. The Chirurgeons of that great City were quite amazed at my Venturing upon ſuch an Operation, and told me, that they not only had never put it in Practice, but not ſo much as ever heard it ſpoken of before that Time.

Of the VENÆSECTION *of the* JUGULAR VEINS *on the* Throat. *By the ſame Author.*

THE Venæſection of the Jugular is adminiſtred in One of the Veins of that Name. Of theſe there are Four, *viz.* Two *External*, which receive the Blood from the *Sinus's* of the *Dura Mater*, and ſend it into the *Venæ Subclaviæ*; and Two *External*, which receiving the Blood from the Face, and the external Parts of the Head, do diſcharge

charge it likewiſe into the *Subclaviæ*. Theſe laſt are the Veins which are opened by a Chirurgeon in certain Diſeaſes.

The Two laſt are call'd *External*, becauſe they are placed nearer to the Surface than the Internal; and when they are tumefied they are very conſpicuous, extending themſelves all along the Neck, *viz.* one on the Right, and the other on the Left Side.

The Opening of theſe Veins is ſubject to ſome Difficulties, upon a double Account; *Firſt*, becauſe there is no ſtreightening the Throat by a Ligature ſufficient to make the Veins ſwell, for fear of intercepting the Paſſage of Reſpiration through the *Arteria Aſpera*; and *Secondly*, becauſe the Skin that covers theſe Veins being looſe, 'tis very hard to hit them right: However, when it is neceſſary to be done, you muſt proceed in the following Manner.

You muſt put the Patient upon a Seat, Elbow-Chair, or Bed; then take a Handkerchief, twiſted together, which is to ſerve inſtead of a Ligature, the middle Part whereof you muſt apply to the back Part of the Neck, ſo that the Two Ends come acroſs each other upon the ſuperior Part of the *Sternum*: The Patient may hold them with both his Hands, in order to pull the Handkerchief as cloſe about his Neck as he can endure it, without intercepting his Reſpiration. You muſt hold your Lancet, ready opened in your Mouth, juſt as it is practiſed in the Venæctions of the Arm, and take it either with your Right or with your Left Hand, according as you intend to bleed on either one or other of theſe Two Sides, and with the other Hand taking hold of the Skin betwixt Two Fingers, make the Punction in the Vein, and after that the Elevation as you withdraw the Lancet out of the Vein; for in the Venæſection of the Jugular Vein you muſt make a larger Orifice than in thoſe of the Arm, becauſe theſe Veins are larger than thoſe in the Arm.

You muſt take away as much Blood as the Phyſician thinks fit to order; and a Phyſician ought ſeldom to be abſent when this Operation is to be performed, becauſe the Patient, by the ſudden Evacuation of Part of the Blood in the Head, which animates and ſupports our Senſes, is apt to fall into a deep Swoon, or may be ſeized with ſome other Symptoms, which require his immediate Aſſiſtance. So ſoon as the Ligature is removed, the Blood ſtops of it ſelf, becauſe it deſcends in a ſtreight Line into the *Subclaviæ*: However 'tis requiſite you ſhould apply a Compreſs, and over it a Band, which muſt be brought round the Neck, and be neither too ſtreight nor too looſe.

Of the PRETENDED TRANSFUSION. *By the ſame Hand.*

THERE is another Operation, known by the Name of the *Transfuſion*, which about Forty Years ago made a great Noiſe at *Paris*; and though this Invention is of a modern Date, and was exploded almoſt as ſoon as it was well begun, a Chirurgeon ought not to be ignorant of what it is that was meant or was propoſed by it: And it is upon that Account that I judged it requiſite to ſhew you how it was put in Practice; not that I intend you ſhould follow it, but rather to deter you from it.

This Transfuſion conſiſts in the Invention of certain Means to tranſmit the Blood, or ſome other Liquor, into the Veſſels of ſome Animal. Mr. *Etmuller* has given us a great many Experiments of different Liquids which he did convey or transfuſe into the Veins of a Dog.

A certain Phyſician, named *Denis*, who uſed to keep Phyſical and Medicinal Conferences at his Houſe, having taken a Fancy that in caſe it were feaſible to transfuſe Blood into the Veins, and at the ſame time

take away that which was there before, the Mass of Blood might by this Means be quite renewed; so that by putting young Blood in lieu of the old, the Animal would become young again.

He communicated his Notions to some others, who being exceeding fond of such-like Novelties and Conferences, this did meet with a general Approbation. They made Experiments of it upon divers Animals, as well of one and the same as of different Kinds. With the supposed Success of which they were elevated to such a Degree, that wherever you came, you could hear them boast and talk scarce of any thing else but the stupendious Effects of this new Invention; nothing being more frequent than to hear them entertain the Publick with repeated Promises of securing Mankind by this Means against all Manner of Diseases, to protract his Life at his own Pleasure, and that in the same State or Condition of Health he should be in at the Time when this Transfusion was first begun with him.

But as the Point still remaining in Question was, Whether what they pretended to have experienced sufficiently in Beasts, would prove of the same Effect in Men? They at last found out some unfortunate People, who, invited by the Lucre of a little Money, did submit to have the Experiment tried upon them: So they opened the Artery of a Calf, and with the Help of a Pipe, one End of which was fix'd within the said Artery, and the other within the Vein of a humane Arm, they conveyed the Blood of the Calf into the Veins of a Man, whilst at the same Time they took away the same Quantity of Blood out of the opposite Arm, as they judged was carried into the other. They did make several of these Experiments, from which they promised to themselves most surprising Effects: But the fatal End of these unfortunate People, who fell Victims to their new-invented Operation, did all at once dash all the Hopes and fine Notions they had framed to themselves of this Project; for some turn'd Fools, others mad Men, and so died. The Parliament of France being informed of what had passed, thought fit by their Authority to put a Stop to the further Progress of such pernicious Inventions; and enacted a Law, by which it was forbidden under most severe Penalties to put this Operation into Practice any more.

But these half-learned Naturalists being unwilling to part with their Notions at once, after they found themselves debarr'd from prosecuting any further their Project of the Transfusion of Blood, did enter upon a new Design of transfusing some other Liquors into the Veins. Of these they made also Experiments of different Sorts, and did not fail to publish a List of what Diseases they were to cure by this Means. Among the rest, they pretended, that by conveying some Jelly-Broth with a Syringe into the Vessels, after an excessive Flux of Blood, the Loss of the Blood would be repaired in a much shorter Time than by any other Way as yet known: And, to be short, they asserted it as an absolute Truth, That in case People would but be perswaded to submit to this Infusion of the Liquors, all the Diseases, let them be of what Nature they would, would be much sooner and much easier cured by it, than by the ordinary Rules prescribed by the Physicians.

But those that fathered this Brat upon the Publick being dead some Years ago, and their detestable Design almost buried in Oblivion, I only thought fit to say something of it here, upon no other Account than to make you sensible, that this is one of those Operations which ought not to be put in Practice.

Dr. *ETMULLER*, in his History of the Infusion of Liquors, is of a very different Opinion from Monsieur *Dionis* in this respect, and asserts not only the Utility but Necessity also, upon certain Occasions, of this Operation, founded upon many Experiments and Reasons. We will content our selves at this Time to give our Reader a short Abstract only of some of the chiefest of his Conclusions relating to this Head, because we shall perhaps have Occasion to treat more at large of this History of the Infusion of the Liquors into the Veins hereafter, when we come to the Description of the Veins and Arteries of the humane Body.

The First Conclusion he draws from his preceding Propositions, founded upon the History of the Infusion of Liquors, is,

That

That this Infuſion is not only exceeding uſeful in it ſelf, but alſo ſometimes very neceſſary, provided it be made as it ought to be, and that in due Time.

He alledges ſome Inſtances in the *Paraſylis*, or the Convulſion of the Muſcles, and the nervous Fibres of the *Oeſophagus*, in Apoplexies, Epilepſies, Hyſterical Fits, and Scorbutick Hypochondriack Caſes, where Deglutition is either much impaired, or quite aboliſhed. He adds alſo the Tumours of the Almonds, the Inflammation of the Muſcles of the *Oeſophagus* and *Larynx* in the Quinſey; as likewiſe exceſſive Vomiting, the Lientery, and *Affectio Caliaca*; in all which, external Applications being of no Effect, and the internal not to be given to the Patient, it is much better and even requiſite in ſuch deſperate Caſes, to make Trial of ſuch-like extraordinary Remedies, than to abandon the Patient.

As to the proper Time when this Infuſion is to be made, he diſtinguiſhes the Diſeaſes into *Acute* and *Chronick*. As for the latter, they being of a long Continuance, do not require an Infuſion, either in their Beginning or Augmentation, but only in their *State*, when none of the ordinary Remedies will take Place. But in caſe theſe Chronick Diſeaſes have their periodical Paroxiſms, he adviſes to make this Infuſion in the Beginning, or in the Progreſs of the Paroxiſm, to allay the Violence of the Symptoms, notwithſtanding the main Diſeaſe be as yet in its Beginning or Augmentation.

As to the acute Diſeaſes, he ſays you muſt examine the Nature of the Fermentation of the Blood, whether it does precipitate the Heterogenious Matter, which the Ancients call'd a *Concoction*, *i. e.* Whether there is any Hopes of a good *Criſis*, or total Diſcharge of the Matter by Stool or by an Abſceſs? That you ought to take care not to make this Infuſion ſo, as to diſturb Nature inſtead of helping it; but that when you ſee all the other Remedies prove unſucceſsful, and that the Event is very dubious, you may proceed to this Infuſion even in the *State* of the Diſeaſe, in order either to ſtrengthen your Patient, or to abate the Violence of the Diſeaſe. This, ſays he, muſt be done without Delay, in caſe you perceive Nature to begin to fail, and not to reſiſt the Diſtemper as before.

His *Second* Concluſion is, That the Liquid that is to be infuſed, muſt be different, according to the different Nature of the Diſeaſe; and that the *Salino Volatil.* and the oleous are the moſt efficacious of all; and next to thoſe, the *Opiata*.

He confines his Conſideration of the ſeveral Liquids to the general Remedies, *viz.* the *Purgatives*, *Diureticks*, *Sudorificks*, Comfortatives, or *Cardiack Medicines*, and the *Somniferous*, or *Opiata*.

As to the *Purgatives* and *Vomitives*, he quite rejects the Infuſion of them; it having been found by Experience, that ſuch like Injections made in Dogs, have produced moſt violent Commotions and Symptoms. Beſides that, they may more conveniently and effectually be given inwardly through the Mouth, and diſcharge themſelves through the ſame Way, and the Inteſtines.

In Relation to the Diureticks, he ſays there is no Doubt, but that by the Injection of theſe Liquor, the Blood may be diſpoſed in ſuch a Manner by them, as to facilitate the Separation of the ſerous Humours in the Reins; but that conſidering that the Diſtempers, where the Diuretick are moſt required, are ſeldom very urgent, this Indication of provoking Urine may as well be anſwer'd by inward Medicines, and conſequently there is no Neceſſity to have Recourſe to an Injection.

The *Sudorificks* are the moſt proper for Injection, either when they cannot be taken inwardly by the Way of the Mouth, or when, after they are taken, they prove unſucceſsful: And theſe Sudorifick Remedies conſiſting of volatile and ſaline Parts may be infuſed into the Blood without the leaſt Fear of cauſing any Diſorder thereby, becauſe it is of the ſame, *viz.* of a ſaline *volatile* Nature, and none but the ſaline *volatile* Remedies are, properly ſpeaking, Sudorifick; though ſometimes they are mixed with ſome Acids, in ſome certain Caſes, when they are to be taken through the Mouth. Some recommend of the Spirit of *Sal Armoniac* half a Dram, it being a pure volatile *Alcali*, without the leaſt Admixture of any Oil, as the Spirit of Hartſhorn

Hartſhorn, and of the humane Blood; and they adviſe to mix with it a Dram of Camphorate Spirit of Wine.

I am not (ſays *Etmuller*) againſt the Uſe of it, when there is Occaſion to receive the natural Heat and Fermentation of the Blood: But for fear theſe Two Spirits ſhould coagulate each other, I would have you mix the Spirit of *Sal Armoniac* with the peſtilential Oil of *Heinſius*, being a Compoſition of *Camphira*, *Succinum*, and Citons, by Means of the Spirit of Wine, and inject about a Dram of it either alone or mix'd with a proper Vehicle. He recommends for the ſame Uſe the Spirit of Hartſhorn, its volatile Salt, as well as that of the humane Blood, and of Vipers, *&c.* And as for the Doſe of them, he refers you to Experience, *i. e.* to reiterated Injections, which muſt firſt be made in a very ſmall, and by degrees in a larger Doſe, according to the Strength of the Patient, the Violence of the Diſeaſe, and the Virtue and Quality of the Liquor to be injected.

Concerning the Comfortative or Cardiack Medicines, he ſays, That they may be injected alſo to quicken and enliven the Spirits, and to preſerve the Fermentation of the Blood in an *Equilibrium*. He recommends above all Things the Injections made with the Eſſence of *Ambergreece* and Spirit of Roſes in a ſmall Doſe, or a Compoſition of the diſtill'd Oil of *Succin.* Spirit of *Cinnamom.* and the volatile Salt of Hartſhorn, mix'd *ſ. a.* together.

Among the *Cardiaca* he reckons the *Opium*, inaſmuch as it allays the impetuous Motion of the Spirits, procures Eaſe and Reſt, and is likewiſe a Sudorifick. He further tells us, that 'tis a certain narcotick Sulphur that is moſt dreaded in the *Opium*; but that the ſame belongs rather to the *Meconium* than to the *Opium*: But the *Opium* being ſomewhat ſcarce, and ſeldom to be had, is not corrected by *May*-Dew, nor by Spirit of Wine, nor by Acids, as it is moſt commonly pretended to be done, but by putting it in Digeſtion with a fix'd Salt, and more eſpecially with the Salt of *Tartar* and Turpentine. He ſays, you may make an Injection of Eight or Ten Grains of *Opium*, thus prepared, diſſolved in a ſufficient Quantity of Cinnamon-Water, in the Augmentation of an acute Diſeaſe, before it arrives to its State.

He draws ſome further Concluſions thence, That there is not a more prompt or quicker Remedy than what is applied by Injections, in very acute Diſeaſes, as the *Syncope*, the Palpitation of the Heart, Apoplexies, Vertigoes, and Epilepſies: And as it chiefly conduces to reſtore the Fermentation of the Blood, he further adviſes its Uſe in hypochondriack and hyſterick Affections, in the convulſive Paroxyſm of the *Aſthma*, and deſperate Cachexies, acute Fevers, with Inflammation, and malignant Diſtempers, where there is no other Hopes of a Cure: But at the ſame Time ſays, it is uſeleſs in hereditary Diſtempers, as in the Gout, Gravel, *&c.* and to ſmall Children, and dangerous to big-bellied Women.

I thought it ſufficient to make mention only of ſome of the laſt of thoſe Concluſions, partly becauſe they are ſcarce ever put in Practice in our Time, partly becauſe we ſhall perhaps have Occaſion to ſay ſomething more of them, as well as of the Hiſtory of the Infuſion of Liquors, when we come to the Veins.

Of the DISEASES *of the* TEETH *and* GUMS, *and* their *CURE. Taken out of Monſieur* Dionis's *Courſe of* Chirurgical Operations, *&c.*

THERE are Two Diſeaſes of the Gums, one call'd the *Epoulis*, the other the *Paroulis*, each of which muſt be cured by manual Operation.

Epoulis is derived from the *Greek* Word *Epi, i. e.* outwards, and of *Ouli*, which ſignifies the Gum; it being nothing elſe but an Excreſcency of the Fleſh, which jets out beyond the Gum, and proceeds from an Excoriation or Exulceration in the Part. Theſe fleſhy Excreſcencies are either ſoft and whitiſh, participating of the Nature of a *Polypus*, or elſe they are hard and ruddy, approaching to the Nature of a *Schirrus*, or Cancer. This Firſt owes its Origin to a pituitous and phlegmatick Blood, and is without Pain; but the laſt, which proceeds from a black melancholy Blood, is always painful.

This Excreſcency muſt be taken off by manual Operation, there being no Means of applying Cauſticks in the Mouth, no more than actual Cauteries, or any Unguents that may conſume them.

You muſt therefore take hold of the Excreſcency with the Pincers, *A.* in order to keep it firm and ſteddy, whilſt with the other Hand, by the Help of the Scalpel, *B.* you cut it off as cloſe to the Gum as you can, yet ſo as not to lay bare the Jaw-Bone. The ſharp-edged crooked Inſtrument marked with *C.* is very proper for the Separation of theſe Excreſcencies.

Some Authors I know adviſe to hold a hot Piece of Iron cloſe to the Place where the Excreſcency is cut off, by the Heat of which they ſay you will dry up the Roots of it: But 'tis ſufficient to rince your Mouth with ſome warm Wine, and to hold to the Wound a ſmall Piece of Linen Cloth ſoak'd in Wine mix'd with Honey. And if the Roots ſhould happen to repullulate, you muſt touch them with *Vitriol*, or the *Infernal Stone*, as often as you find it requiſite, and then cicatrize the Wound.

The Word *Paroulis* has its Derivation from the *Greek* Word *Para, i. e.* near, and *Ouli*, the Gum. This Diſeaſe is an Inflammation of the Gums, which oftentimes goes into a Suppuration, and owes its Riſe moſt commonly to a rotten Tooth, which by the painful Irritation cauſed by it, determines the Humour to fall upon that Part, where, by the Conflux of thoſe Juices, they ſettle, and turn into an Abſeſs, as well by the Moiſtneſs and Heat of the Mouth, as the Thinneſs and Tenderneſs of the Fibres of the Gums.

Theſe Defluxions, after having cauſed a Swelling, grow exceeding painful before they come to a Suppuration, which muſt be furthered by holding ſome warm Milk in the Mouth, and the Applying of a Fig ſplit in the Middle, and roaſted upon Coals, to the Gum. And ſo ſoon as you find the leaſt Fluctuation in it with your Finger, you muſt open it immediately, for fear the Matter being detained within may cauſe an Alteration in the Jaw-Bone.

For this Purpoſe you muſt take the Lancet, *D.* ſuch as we uſe in Bleeding, and wind it up in a Piece of Cloth, to hold it the more ſteddy by the Handle; and after the Chirurgeon has put it into his Mouth, he opens the Patient's Lips with both his Hands, in order to diſcover the true Situation of the Tumour, which ſometimes is next to the *Dentes Molares*, or Grinders, betwixt the Gum and the Inſide of the Cheek. Then he muſt take with his Right Hand the Lancet out of his Mouth, and thruſting it into the ſmall Prominency made by the Matter contained within, he'll ſee the Matter come out as ſoon as the Inſtrument is withdrawn. Let him afterwards ſqueeze the Remainder out of the Tumour, give a little warm Wine to the Patient to waſh this

his Mouth, and order him to do the ſame for Two or Three Days after.

In caſe this ſmall Abſceſs happens to appear on the upper Gums, it is much eaſier cured, becauſe the Wound giving Vent to the morbifick Matter, it is eaſier diſcharged thence by its own Weight, as far as it is bred within; ſo that there is no further Fear of any enſuing Diſorder, or ill Symptoms: Whereas when this Abſceſs lights upon the inferior Gums, the *Sanies* remains there, as if it was incloſed in a Bag, and if detained there, may cauſe a Corruption in the Lower Jaw-Bone, which I have obſerved ſeveral times. To avoid this Danger, you muſt lay it open in time, ſqueeze it often, ſo as to make the *Pus* come out from below upwards out of the Aperture, and applying on the Outſide a Compreſs and a Bandage, which by ſtreightening that Part will hinder the Matter from gathering thereabouts.

But if, in Spight of all your Precautions, the Bone be laid bare and altered, you will find it a hard Task to procure an Exfoliation by any other Means than by the Searing-Iron; but this ought to be your laſt Recourſe, *viz.* when all other Means have proved ineffectual, this Bone being reputed one of the hardeſt of all belonging to the humane Body.

Of the OPERATIONS *belonging to the* TEETH. *By the ſame Author.*

THE Teeth alone find Employment for a good Number of People, commonly known by the Name of *Operators for the Teeth.*

Doubtleſs, theſe Gentlemen who have no other Object to work upon but only the Teeth, may be ſuppoſed to excel in this particular Point, beyond what is to be expected from the Chirurgeons, whoſe Art is of ſo vaſt an Extent; notwithſtanding which, a Chirurgeon ought not to neglect or ſet aſide this Part of Chirurgery, which is accompliſhed by Seven different Operations.

The *Firſt* is to open or ſeparate the Teeth when they are too cloſe together.

The *Second*, to clean the Teeth when they are very black or ſtained.

The *Third*, to prevent their being corrupted or rotten.

The *Fourth*, to ſtop their Holes or Hollowneſſes.

The *Fifth*, to file them when they are too long, or of an unequal Length.

The *Sixth*, to draw them out when they are corrupted or elſe ſpoiled.

And the *Seventh*, to put in artificial Teeth inſtead of the natural Ones.

Sometimes it happens, that both Rows of the Teeth will ſtick ſo cloſe to each other, that 'tis next to an Impoſſibility to part them aſunder to take Nouriſhment. This Accident may be the Conſequence either of a Wound, or of an Abſceſs of the *Parotides*, where the *Cicatrix* has been formed, without putting ſome ſmall Piece of Wood betwixt the upper and the lower Teeth, to keep them at a ſufficient Diſtance from each other. In Children of a melancholy Diſpoſition, and of an obſtinate Temper, you will find their Teeth ſet cloſe together: And whenever Convulſions happen in thoſe Muſcles that draw up and downwards the inferior Mandible, this Indiſpoſition may be obſerved in the Teeth, which a Chirurgeon muſt endeavour to remedy by thruſting the Elevatory, *E.* betwixt the Teeth, in order to ſeparate with the Help of it the ſuperior Row from the inferior, and there he muſt put into the Aperture made by the Elevatory the Inſtrument *F.* which being once fix'd betwixt them, will force the Two Mandibles to open, and to part aſunder, whenever you come to turn the Screw fix'd along the Middle of this Engine; but you muſt turn gently, leſt you ſhould do Harm to the Parts. The Teeth being open'd, you give Nouriſhment to the Patient; and withdrawing this Kind of *Dilatatory*, you put inſtead of it a Piece of Wood betwixt the Teeth, and leave it there, to keep them from cloſing together again in the ſame Manner as before the Operation.

In caſe you find it impracticable to part the Teeth aſunder, you muſt break one out,

that through the Aperture you may put the Horn, *G.* through which you may convey the Nouriſhment into the Patient's Mouth, and ſo keep him from being ſtarved to Death: Or elſe you may convey ſome nouriſhing Liquids through the Noſtrils. Others adviſe to apply nouriſhing Clyſters.

In the Year 1702. among the Wounded we had whilſt we were Cannonading before *Nimeguen*, and which were carried to *Cleves*, we had Seven or Eight whoſe Teeth were ſet cloſe together by Convulſions, and that to ſuch a Degree, that we were not able to open them, except to only Two or Three, who were preſerved, but all the reſt died.

To clean the Teeth is an Employment ſo common, as ſeems ſcarce to deſerve the particular Application of a Chirurgeon. You ſee every Day People to pick their Teeth after Meals with a Tooth-pick, *H, H.* or with a Quill, *I, I.* which, to ſpeak the Truth, is very requiſite, becauſe ſome Remnants of the Aliments will ſtick betwixt the Teeth, which will corrupt them, and produce a ſtinking Breath. 'Tis alſo very convenient every Morning to waſh the Mouth, and rub the Teeth with one of the little Spunges, *K, K.* to wipe off the Slime that will ſettle upon them, and preſerve their natural Whiteneſs. But after all, take what Care you can, there will ſettle certain Cruſts near the Gums, which will make the Teeth yellow; and on the Inſide there will arite certain hard Scales, which cannot be removed without the Aſſiſtance of certain Inſtruments: And upon this Account it is, that thoſe that are curious of their Teeth, do often make uſe of thoſe who make it their daily Employment to clean them.

In this Operation, there is no leſs Dexterity required than in moſt others; for Ladies, and other nice Perſons, will not ſuffer a Man to go roughly, but neatly and Dextrouſly, about this Work. 'Tis therefore that you muſt be ſure to wrap the Left Hand, wherewith you lift up the Upper-Lip, or draw down the Inferior-Lip, in a white clean Linen Cloth; and in caſe the Inſtrument you are to uſe be of Iron, you muſt likewiſe cover it with clean Linen.

Then the Operator, having ſeated the Perſon with his Face turned to the Light, and all his Inſtruments near him, he muſt place himſelf a little on one Side of the Perſon thus ſeated, with one Knee on the Ground, to perform the Operation with the leſs Trouble, he takes a View of all the Teeth one after another, and by turns makes uſe of ſuch Inſtruments as he finds beſt ſuitable for his Purpoſe; but muſt take care all this while not to draw Blood from the Gums.

After he has removed all the Incruſtations and Scales, he rubs all the Teeth with an Opiate, he orders the Perſon to waſh his Mouth ſeveral Times with fair Water, and ſo the Buſineſs is done. Some of theſe Gentlemen, I know, will preſent to thoſe they know to be good Cuſtomers a ſmall Pot of this Opiate, and one of the Roots.

All the Inſtruments that are made uſe of in the Cleaning of the Teeth being very ſmall, are contained in one Caſe; and as there is a good Number of them, they are mounted on a Haft, or Handle, with a Screw, *N.* according as Occaſion offers. They are of different Figures, ſome being like unto a *Dechauſoir*, *O.* to enter betwixt the Teeth; others like a Siſſar, *P.* others reſemble unto the Rugines, *Q, Q, Q, Q.* and others to the File, *S.* All theſe are commonly made of Steel, excepting thoſe made on Purpoſe for the King and the Princes, which are of Gold.

'Tis not ſo eaſie a Thing as ſome may imagine to keep the Teeth always ſound. He that undertakes ſuch a Task, will find himſelf often miſtaken in his Aim and Promiſe; for along the Filaments of the Roots of the Teeth there runs a certain corroſive Seroſity, not unlike an *Aquafortis*, which undermines them by little, and often never leaves them till they drop out by Piecemeal. If a Way could be found out to drive that Seroſity another Way, the Teeth would be preſerved ſound and entire as long as we live: But all that is in our Power now to do, is no more than to prevent the *Caries*, whenever it makes its Appearance, from ſpreading farther.

If this *Caries* be in Sight, you muſt ſhave or raſp it with the Rugine, *T.* If it be betwixt Two Teeth, you muſt file the Blackneſs off with a File, *V.* If there is a Hole upon

upon the broad ſuperior Surface of a Tooth, you muſt cauterize it with Oil of Sulphur or Vitriol; of which you muſt convey about a Drop at a Time within the hollow Tooth, by the Help of one of theſe ſmall Pencils that are uſed in Miniatures; and if notwithſtanding this the *Caries* increaſes, you muſt endeavour to ſtop its Progreſs by an actual Cautery, *X.* which after you have made hot, you muſt with it touch the whole Cavity of the Tooth; and if after all the Tooth becomes more and more rotten, and the Pain grows inſupportable, there is no other Remedy left than to pull it out.

The *Fourth* Operation belonging to the Teeth, is to ſtop up the Holes that are made in them: For it frequently happens, that by ſome Defluxion of a Seroſity upon a Tooth it is hollowed, though after the Defluxion is over, the Hole does not grow bigger; and though theſe Holes are for the moſt Part not attended with Pains, they are nevertheleſs very troubleſom, becauſe as often as you take any Aliments, they will ſtick in this Hole, and conſequently muſt be pick'd out every Time you eat, which is not eaſily to be done neither, if the Tooth is ſeated where you cannot well reach it with your ordinary Inſtruments.

Some other People there are who cannot drink cold Liquors, becauſe if but a Drop of the Drink happens to enter into the Hollowneſs of the Tooth, it creates exceſſive Pain: And others there are, who have ſuch an ill Smell within the Mouth upon this Account, that they are always obliged to chew ſome Aniſeed or Cinnamon, to correct that Imperfection, becauſe they are ſcarce able to ſpeak to any Body without communicating this ill Scent to them.

To remedy all theſe Inconveniencies, you muſt endeavour to ſtop the Hole that is in the Tooth. Some have attempted to effect this with the Leaves of Gold or Silver, but theſe will not ſtay there very long; and therefore it is much better to put into it a ſolid Piece of Gold or Silver, adapted exactly to the Figure of the Hole wherein it is to be plac'd.

Others prefer Lead to the reſt, becauſe being very tractable, it will enter and fill up the Cavity much eaſier than any other Metal, and yet is leſs ſubject to introduce any Alteration into the Part than Gold it ſelf. But others, without giving themſelves any further Trouble about the Matter, fill up theſe Holes with Wax, which anſwers the ſame End, ſince it keeps out the Aliments and Liquids.

The *Fifth* Operation belonging to the Teeth, is the Filing of them, which is put in Practice upon Three different Occaſions, to wit, to ſeparate them when they grow one over another; to put them upon the ſame Level when ſome of them are too long; and to make them ſmooth and even when they have ſome pointed Prominencies ſtanding inwards, which hurt the Tongue, or outwards, which hurt the Cheek.

All this is performed by Means of a ſmall File, *V.* with a Haft or Handle to it, that you may be able to hold it the better. It muſt be eaſie, that it may not ſhake the Teeth; for though it does not diſpatch ſo faſt as a rough File, 'tis better to beſtow a little more Time; and therefore the Operator ought alſo with one or Two of his Fingers to ſuſtain the Tooth whilſt he is filing it, leſt it ſhould crack or break.

When you are to ſeparate the Teeth, take Heed not to file one more than the other, that ſo the Interſtices betwixt them may be equal. 'Tis to no Purpoſe to pretend to file off a Tooth that is longer than the reſt, if the oppoſite Tooth be wanting, unleſs you will reſolve to continue ſo to do from Time to Time, becauſe it will always grow again beyond the reſt; it being certain, that the Teeth grow; to repair the Loſs that is ſuſtained by rubbing and wearing out againſt one another by Maſtication; of which you may be convinced by Experience, in thoſe Perſons that have a Tooth miſſing, for then that againſt it which uſed to rub or ſtand before will ſoon grow longer, and enter into the Interſtice left by the Tooth that was loſt.

The *Molares*, or *Grinders*, have oftentimes certain pointed Prominencies, either when they are entire and ſound, or elſe when they begin to be rotten, and that a Piece of them is broken off. When any of thoſe Points prick either the Tongue or the Cheek, you muſt take off theſe Prominencies by the Help of the File, which muſt be done with all imaginable Gentleneſs and Dexterity.

The

The *Sixth* Operation relating to the Teeth is that of Drawing them, being that which is practiſed moſt of all; there being very few who have not a Tooth drawn one Time or other: And ſome People are ſo impatient, that ſo ſoon as they feel the leaſt Pain thereabouts, ſome of the Teeth muſt come out; a very pernicious Cuſtom to run thus immediately to a Tooth-Drawer, becauſe it happens very often, that the Pain ceaſes of it ſelf not long after, and then what Reparation is there to be had for the Loſs of your Teeth? And therefore I would not have you reſolve upon this Operation, unleſs the Tooth is ſo much rotten, that there is no Hopes left of preſerving it, or that the Pain which it produces in the Gum is ſuch, as to be almoſt continual and inſupportable; for thoſe that make ſuch Haſt in unfurniſhing their Mouth upon every tranſitory Pain, will have ſufficient Leiſure to repent of it in due Time.

However, there are Five or Six Occaſions when the Drawing or Pulling out of a Tooth ſeems to be neceſſary: The *Firſt* is in Infants, when their Firſt Teeth, call'd the *Milk-Teeth*, are diſpoſed to fall out; then ſo ſoon as they begin to looſen, you need not make any Difficulty of pulling them out, which may be done by tying only a Thread about it, wherewith you turn the Tooth, and then pull it out. 'Tis the general Opinion, that the ſooner you pull out one of thoſe Firſt Teeth, the more ſtreight that which comes after it will prove. There is but little Reaſon for this Opinion; but as long as it muſt come out, it is beſt for the Chirurgeon to pull it out; for in caſe the ſucceeding Tooth ſhould not prove ſtreight or handſome, the Mother would be ſure to lay the Fault of it at his Door, Women being moſt commonly very tenacious of vulgar Errors and Prejudices.

The *Second* is, when the Teeth looſen of themſelves without being ſhaken by any external Violence, or cracking any Thing that is too hard: In any ſuch-like Caſe I would not however have you be too forward in pulling out the Teeth, but on the contrary endeavour to faſten them again within their *Alveoli* with an adſtringent Wine, in which you may ſoak a ſmall Spunge, and hold it to the Gum, and reiterate it often, forbidding your Patient not to chew on that Side, where the Teeth require Reſt to faſten again: But when a Tooth is ſo looſe that there is no Hopes of faſtening it again, and that it will not bear being touch'd by the Aliments, you muſt take it out; which may be done by bending it only from one Side to the other, and to raiſe it with your Two Fingers, without the Aid of any other Inſtrument, eſpecially in aged Perſons, whoſe Teeth will thus come out one after another.

The *Third* is when a Tooth is ſo far rotten, that the flat Part of it is almoſt eaten away; for in this Caſe, if you delay to draw it till it is quite eaten away, there will be ſcarce any thing left for the Inſtrument to take hold of, and conſequently to pull out the Remnants of it; and therefore 'tis no more than common Prudence to remove it from a Place where it can prove only incommodious.

When you are to draw Teeth that are ſtill firmly fix'd within their *Alveoli*, you muſt be provided with ſuch Inſtruments as are adapted to ſecond the Efforts you are to make for ſuch an Extraction; of which, more anon.

The *Fourth* is, when a Tooth is either broken, ſo that there remains nothing behind but the Root, or that it is ſo far corroded, as that there remains only a Stump of it; 'tis then that the Operator has ſufficient Opportunity of ſhewing his Dexterity; and if here he tells the People ſtrange Things of drawing them out without much Pain, he is in the Wrong, as moſt of your Operators are apt to do: Whence that Proverb [*He lies like a Tooth-Drawer,*] has taken its Riſe. A Chirurgeon will ſtand in need of all his Induſtry to pull out thoſe Stumps or Roots of the Teeth that are fix'd deep into the *Alveoli*; for which End he muſt make uſe of the Inſtrument call'd the *Impulſorium*, if the Stump ſtands as yet a little above the *Gum*; or of a *Tenaille*, like a Raven's Beak, or of ſome others, which I ſhall deſcribe to you anon.

The *Fifth* is, when a Tooth jets outwards, it muſt be taken out; for a Tooth thus placed beyond its Rank is very incommodious to him that is troubled with it,

and carries a certain nauſeous Deformity along with it.

In caſe this Tooth does not ſtand out very much beyond the reſt, it may be filed, or elſe cut off with the *Tenailles Inciſores*, as far as there is too much of it; but in caſe that flat Part which ought to look inwards of the Mouth, ſtands outwards, it is much better to want one Tooth, than to leave it ſo as to prove a Disfigurement to the Party: And therefore it ought to be drawn with one of the Inſtruments, ſuch as the Operator ſhall judge moſt agreeable to his preſent Purpoſe.

The *Seventh* is, when ſome ſupernumerary Tooth makes its Appearance, (becauſe it often happens, that a Tooth which is not of the Number of thoſe belonging to the Jaw-Bones, nor placed as the reſt are, does ſtrike againſt one or other of the ſaid Jaws;) and there are ſome Perſons who have abundance of ſuch ſupernumerary Teeth, and others who have a double Row of Teeth, who (if we may believe the Fortune-Tellers) are born to very good Fortune: But I look upon it rather as a great Misfortune, to ſee ones ſelf expoſed or obliged to ſuffer ſuch cruel Pains as thoſe are, that muſt of neceſſity accompany the Drawing of ſo many ſuperfluous Teeth, which thoſe pretended Prophets would make People believe were deſign'd them by Nature as certain Marks of their future Greatneſs.

Thus it happen'd with the Duke of *Berry*, unto whom ſuch a Pretender to Prophecy told abundance of fine Things upon that Account, when he was ſcarce Eight Years of Age; to little Purpoſe; for ſince by his high Birth, and his own uncommon Perſonal Qualifications, he was entitled to much more than what thoſe modern Prophets were able to tell him. Their pretended good Fortune turn'd in him into a Misfortune, he being obliged to have them pull'd out, and conſequently to endure thoſe Pains that are inſeparable from ſuch-like painful Operations.

Abundance of Inſtruments are requir'd in theſe Operations; for you muſt be provided with different Sorts, to make uſe of ſuch among them according as you meet with different Sorts of Teeth that are to be drawn. I have given you an Account here of ſuch only as cannot be ſpared.

(1.) A *Dentiſcalpium*, as it is call'd in *Latin*, and in *Greek*, *Pericharacter*, which is derived of the Word *Peri*, *i. e.* about, and of *Cheraſſein*, which ſignifies to ſcarify, or cut, becauſe with this Inſtrument we ſeparate the Gum from about the Tooth that is to be drawn or pull'd out.

(2.) The *Denticulum*, or *Denticeps* in *Latin*, being a Kind of a *Tenaille*, the Extremity of which, that is to graſp the Tooth, is crooked and bifid like a Fork, to hold it the more firm. It is adapted both for the Teeth of the inferior and ſuperior Jaw-Bones, and is one of the moſt ancient Inſtruments uſed in Chirurgery.

(3.) A *Pelican*, call'd by the *Latins Polycampus*, from its Reſemblance to the Beak of a *Pelican*, and by the *Greeks Odontagra*, which has its Derivation from *Odous*, *i. e.* a Tooth, and of *Agrevein*, *i. e.* to draw or pull away, it being an Inſtrument with ſeveral Branches, mounted by the Means of one Screw upon one Handle, and is very convenient for the drawing of the Teeth. The Two Ends are a little round, that ſo they may reſt the better upon the Root of the rotten Tooth: And of the Two Branches, one of theſe is ſtreight, and the other bent, each of them being adapted to ſome peculiar Uſe, under different Circumſtances.

(4.) A Kind of an Elevatory, *E.* framed in the Nature of a Leaver, one of the Extremities of which is flat, the better to reſt upon the Gum below the Tooth; and the other is bent like one of the Branches of the Pelican, to graſp the Tooth. The Two Branches are mounted upon a large Haft or Handle. When you have taken Hold of one of the lower Teeth with this Inſtrument, you need only let the Handle go downwards, to pull it out. It is the moſt commodious of all the Inſtruments, and of a late Invention: And I know none who has as yet made uſe of it, excepting Monſieur *Dubois* the King's Tooth-Drawer.

(5.) The *Impulſorium*, as it is call'd be the *Latins*, is an Inſtrument, the Extremity whereof is forked, and is provided with a Handle. It is adapted to the *Dentes Inciſores* and

and *Canini*, which have no more than One ſingle Root, to thruſt them out of their *Alveoli*, and to the Stumps of Teeth, if they can be taken hold of.

(6.) A *Root-Drawer*, deſcribed by *Gillman*, call'd in *Greek Roſagra*, and commonly a *Riſagran*, being a Compoſition of Two Words, ſignifying as much as *Deraciner*, or to root out. This is a Kind of a *Tenaille*, the Ends of which are almoſt quite ſharp-pointed, the better to enter into the *Alveoli*, and take hold of the Remnants of a Root left behind there. This Inſtrument is abſolutely neceſſary for a Tooth-Drawer.

(7.) A *Tenaille*, call'd the *Raven's-Beak*, from its Figure. It ſerves for the Extirpation of the Stumps of the Teeth, and to cut off their Extremities, in caſe they are too ſharp-pointed.

(8.) A Pair of *Inciſive Tenailles*, by the Means of which we cut from the flat Part of a Tooth any Prominency that jets outwards beyond the ordinary Size of a Tooth.

Neither is it ſufficient alone to know theſe Inſtruments, unleſs you are informed alſo how to make uſe of them with Dexterity, and to the true Purpoſe.

You muſt order the Perſon who is to have a Tooth drawn to ſeat himſelf upon the Ground, upon the Cuſhion only, when the Operator is to ſtand behind him, ſo as to be able to put the Head betwixt his Thighs, with the Mouth turn'd a little upwards, that ſo he may the better diſtinguiſh the rotten Tooth from the reſt, for fear of a Miſtake: Then he muſt ſeparate the Gum with the *Dentiſcalpium* from the Tooth he has taken hold of with his Fingers, which done, he draws or pulls it out with one of the before-mentioned Inſtruments, ſuch as he finds moſt ſuitable to his preſent Purpoſe.

If you have performed your Operation right, the Patient, as ſoon as he leans forwards, will ſpit out both the Tooth and ſome Blood that comes out of the Gum, of which you may let come forth a Spoonful or Two before you order the Patient to waſh his Mouth with ſome *Oxicrate*. You muſt alſo with your Two Fingers pinch the Gum together from whence the Tooth was drawn, in order to thruſt the Parts that were ſeparated by the Extraction together; and your Patient muſt continue the Uſe of the Oxicrate for the whole Remainder of that Day.

The main Part of this Operation does conſiſt chiefly in the Strength of the Wriſt; and you muſt reiterate your Effort in caſe the Tooth does not come out at firſt; for you muſt not give off till it be pull'd out. 'Tis upon this Account that ſuch Chirurgeons as are nice, and frequently practiſe Phlebotomy, and ought therefore to make it their Buſineſs to have a ſteady and light Hand, ought not to apply themſelves to Tooth-Drawing, leſt by the ſtrong Efforts they are obliged to make in this Operation, they ſpoil the Steadineſs of their Hand; and therefore it is better to leave this Employment to the Operators for the Teeth. Beſides that, this Art of Tooth-Drawing favours not a little of the Mountebank, occaſioned by the vain Pretences of thoſe that practiſe it, who are apt to make People believe, that they can draw the Teeth tho' never ſo deeply rooted within their *Alveoli*, either with their Fingers alone, or elſe with the Point of a Sword; a Thing highly unbecoming the Profeſſion of Chirurgery.

The *Seventh* and laſt Operation to be made upon the Teeth, is to ſet in artificial Teeth inſtead of thoſe that are loſt. Two Reaſons are alledged in Behalf of this Operation; the *Firſt* is, for *Ornament*'s Sake, it being a very ill Sight to ſee a Man want many Teeth in his Mouth: And the *Second* is, the better Articulation of the Voice; for thoſe that want many Teeth cannot pronounce certain Words ſo exactly as thoſe that have all their Teeth.

To obviate therefore thoſe Inconveniencies, they make Teeth of Ivory, much about the ſame Size with thoſe that were loſt: Theſe muſt be perforated, that ſo you may paſs through the Holes a Golden Wire to faſten them to the next adjacent Tooth, by turning it round about them, which will keep theſe artificial Teeth as firm and ſteady as if they had been fix'd there by Nature. You muſt have as many of them made as you have Occaſion for, Two, Three, or Four, *&c.* which muſt be conjoin'd together by Means of the Golden Wire, and then be put as I told you betwixt the natural Teeth that are ſtill remaining entire.

There are ſome old Ladies who have a whole Set of thoſe falſe Teeth in their Heads, and therefore ſcarce dare open their Mouths for fear the Cheat ſhould be diſcovered.

The worſt of theſe artificial Teeth is, that they will ſoon turn yellow: Whence it is, that *Fabricius* adviſes to have them made of the Bone of the Ham of an Ox; and *Guillemeau* preſcribes a Paſte, which he ſays is a Compoſition of White Wax, which muſt be melted with a little *Gum Elemi*, adding to it *Maſtich*, White Corals, and Pearls, well powdered. He tell us, That out of this Paſte you may frame Artificial Teeth, which will never turn yellow; and that this Paſte is of excellent Uſe likewiſe to fill up the Holes of hollow Teeth.

(Our *Engliſh* Operators make Uſe of Sea-Horſe Teeth inſtead of the Ivory.)

There are Two Queſtions in Vogue among the Chirurgeons or Operators for the Teeth, *viz.* Whether, after you have pull'd out the Milk-Teeth of a Child, before they are ready to fall out of themſelves, the Second or ſucceeding Teeth will upon that Account prove more fair and ſtreight? And Secondly, Whether a Tooth, when once pull'd out, and put into its Place again, may be faſten'd to its Root, and take new Life as if it never had been drawn?

'Tis a vulgar Error to imagine, That the Firſt Teeth can give an ill Shape or Figure to the next ſucceeding, they being one as well as the other framed from the Birth of the Infant, and oſſified within the *Alveoli*; with this Difference only, That thoſe that come out firſt of all, after having performed their Functions for Five or Six Years, are puſh'd out by the Second, which ſucceed in their Places: Where it is to be obſerved, That the Firſt conſiſt ſcarce of any Thing but what ſtands beyond the Gums, becauſe the Second encreaſing in Bulk, would not allow ſufficient Time to the Firſt to accompliſh and have their Roots oſſified; ſo that there is not the leaſt Probability that the Firſt ſhould impair or ſpoil the Figure of the next ſucceeding.

Of this, I ſaw an Inſtance in a young Girl: Her Mother being a very whimſical Woman, would needs have all her Milk-Teeth pull'd out a whole Year before the Time that they were to fall out of themſelves, being perſwaded thereunto by ſome other Women of the ſame Kidney, who told her, That the next that would ſucceed them, would be much more perfect; but found herſelf moſt miſerably deceived in her Expectation; for the laſt proved much worſer than the preceding had been.

I knew another Lady of Quality bigotted to a Degree of Madneſs, who had her Daughter's Teeth drawn by a quite contrary Motive; for this young Girl having exceeding fine Teeth, the Mother, fearing leſt ſhe ſhould be too proud of them, would have them all drawn out at once, being told, that if ſhe did ſo, the next ſucceeding would not be near ſo handſome as the former; which was what ſhe deſired, as ſhe ſaid, that the Handſomneſs of her Daughter's Teeth might not prove an Obſtacle to her Salvation.

As to the other Queſtion, I cannot believe that a Tooth, after it is quite pull'd out, can poſſibly be faſten'd and take Life again in the ſame *Alveolus*. Monſieur *Verdue* relates, That he has heard Monſieur *Carmeſine*, a very dextrous Operator for the Teeth, ſay, That having at a certain Time pull'd out a Tooth that was not rotten, he put it in again immediately in the ſame *Alviolus*, where it was ſoon faſten'd, and that to ſuch a Degree, that he had enough to do to draw it the next following Year, when the ſame Perſon came to him a Second Time to have it pull'd out, becauſe he was was ſeized with an intollerable Pain in that Tooth. But this Account ſeems to me Romantick, as in Effect it did to Monſieur *Verdue* himſelf, he being ſufficiently convinced, That all the ſmall nervous Threads, and the Veſſels which carry Life and Nouriſhment to the Teeth, being once quite broken aſunder, 'tis impoſſible they ſhould take Root again and be reunited to the Whole, after having been once entirely ſeparated from it.

Of the CHIRURGICAL OPERATIONS *that are performed upon the* GUMS *of the* Teeth. *By* Fabricius ab Aquapendente.

THE Gums being ſubject to moiſt and cold Defluxions, are apt to ſwell, to putrefy, and to contract a Blackneſs, which occaſioning the Teeth to looſen and fall out, require the Aſſiſtance of the Hand of a dextrous Chirurgeon. This Operation is performed by the Means of a Searing-Iron, wherewith they muſt be cauterized, but ſuperficially only, for elſe it will not only take away the moiſt Humour, but alſo the Subſtance of the Gums it ſelf.

If the Gums happen to ſwell to ſuch a Degree, as almoſt to cover the Teeth themſelves, you muſt firſt apply your Cautery on that Part, and this muſt be done with ſmall Searing-Irons, by the Help whereof I have ſeveral Times cured and taken away the Swellings of the Gums, when they were quite putrid and turn'd livid. After the Cauterization of the Gums, you muſt beſmear them with Honey, and waſh them with Honey and Water, and if any putrid Ulcers begin to appear, you muſt rub them with drying, repelling, and adſtringent Medicaments, ſuch as the Powder of Roſes, of the *Verbena*, *Galla*, *&c.*

In caſe the Gums are affected with a ſmall Tumour, or with a ſlight Abſceſs only, the Firſt of theſe Affections is call'd an *Epulis*, and the Second a *Parulis*.

The *Epulis* muſt be cut off with a Pair of Siſſars, or a crooked Inſtrument like a Hook; but the *Parulis*, after a circular Inciſion is made in it, muſt be treated with proper Liniments. If the Tumour of the Gums be accompanied by a thick and putrid Fleſh, protuberating backwards at the *Dentes Molares*, it will then prove a very hard Task to apply the Searing-Iron or Cautery, partly becauſe the thick Fleſh is not eaſily to be conſumed by the Cautery, unleſs it be conſumed by ſome conſiderable Time; partly by reaſon of the narrow Compaſs of the Place, and the next adjacent Parts, which will not admit the Application of the hot Iron in that Part of the Mouth. To obviate as much as may be this Inconvenience, your beſt Way will be to cut out as much as you can of this Fleſh with a Knife like a Penknife, but much bigger; after which you may endeavour to conſume the Remainder of it, by applying an actual Cautery to it, as well as to the Jaw-Bone unto which the Infection has been communicated.

If you find a conſiderable Flux of Blood to enſue upon the Inciſion made by the Knife, you muſt nevertheleſs perſiſt in the Inciſions, which may be made with the ſame Knife, or at leaſt with one of the ſame Make or Shape, but only made red-hot before; as for Inſtance, with a Knife, the Blade whereof is ſtreight, but only hook'd or incurvated at the Extremity, according as you find it moſt ſuitable to the Place and your own Experience.

Laſtly, to take off the Remainders of the corrupted Fleſh, and of the ſubjacent Bone, which by the Contact of the putrid and glandulous Fleſh has contracted a Corruption alſo, you muſt make uſe of actual Cauteries, or red-hot Iron Inſtruments, adapted for your intended Operation, which may be conveyed to the affected Part thro' ſmall *Cannulæ*, or hollow Pipes, which reaching or covering the whole Length of the Inſtrument, prevent their touching upon and impairing the ſound adjacent Parts, whilſt the Inſtrument, in that Part where it is without the *Cannula*, exerts its Operation upon the tumefied and putrid Fleſh.

In what Manner the GUMS *may be reſtored after their Eroſion by corroſive Humours.*

THE Firſt Thing we have to do in this Caſe, is to remove the Cauſe which produces this Eroſion by proper Purgatives; but as to the external Applications to the affected Part, put White-Wine, in which the Roots of the *Tithymalus* of all Sorts have

been boiled, which are very proficuous, if kept in the Mouth ſeveral Times in a Day. But this Application will perhaps not be judged to deſerve a Place among the Chirurgical Operations, and therefore we will not inſiſt any further upon it.

Of the CHIRURGICAL OPERATIONS *to be performed upon the* TEETH. *By the ſame Author.*

THERE are no leſs than Seven Chirurgical Operations belonging to the Teeth; The *Firſt* is, when the Teeth are ſo cloſely ſet and fix'd together, that they muſt be parted leſt the Patient ſhould die for want of Food. The *Second* removes the Filth and nauceous Scent that is gathered ſometimes in the Mouth. The *Third* gives Aſſiſtance to the carious and to the perforated Teeth, to ſtop the *Caries*. The *Fourth* fills up the hollow Teeth with Gold to preſerve them. The *Fifth* takes out ſuch of the Teeth as are not grown or fix'd in their natural Places, as when they ſtand inward, or too much outward, and thus are offenſive either to the Tongue or to the Cheeks. The *Sixth* takes off or rather ſtops the Growth of the Teeth, that are grown without their natural Places, and prove incommodious to the Party. The *Seventh* pulls or draws out the looſe, painful, and rotten Teeth.

To begin with the Firſt, it is to be obſerved, That both the Rows of the Teeth may be cloſed or fixed together Two different Ways, *viz.* either by a voluntary or involuntary Action or Compreſſion. In caſe it is *voluntary*, as in Children and melancholy People, then the Cauſe of this Symptom does not belong to the affected Part; but if *involuntary*, then you muſt look for the Cauſe of this Diſeaſe in the Parts that are ſubſervient to the Motions of the Jaw upwards: And theſe are affected either principally (as for Inſtance, when the Muſcles are ſwell'd); or elſe by Conſent only, to wit, from the Brain (as in Convulſions).

In caſe therefore this Conſtriction or Cloſing together of the Teeth does not ariſe from the Muſcles that move the Jaw-Bone upwards, but is accidental, (as in Children of an obſtinate Temper, and in melancholy Perſons) it is ſometimes no very difficult Task to open or part them aſunder by the Help of ſtrong Inſtruments, yet ſo as that the Children require one Sort, and Perſons of a more advanced Age another Sort of Inſtruments.

But ſometimes it happens alſo, that it proves no eaſie Task to diſcloſe and open the Teeth and the Mouth; I ſay, it is no eaſie Task, eſpecially in Perſons addicted to Melancholy; in which it is often obſervable, that they will draw upwards the Jaw, and ſet or fix together their Teeth with an almoſt incredible Force and Strength: And that the Motion of the Jaw upwards is exceſſive ſtrong, is manifeſt from thence, that there have been People who could lift up Two Hundred and Fifty Pounds Weight with their Teeth; beſides that, the Strength, as well as the Number of the Muſcles belonging to the Under-Jaw, ſufficiently evidence the Force of its Motion.

If the Cauſe of this Conſtriction of the Teeth does depend from the Muſcles, as in Convulſions, or when they are ſwell'd, in this Caſe, if there be no Pain, you may make uſe of Iron Inſtruments to open them; but in caſe there be great Pain join'd with this Conſtriction of the Teeth, you muſt abſtain from violent Inſtruments or any forcible Operation to open them, for fear of worſe Conſequences, ſuch as may affect the Brain, and prove fatal to the Patient; or at leaſt, you muſt not proceed to theſe violent Means, before you have applied Lenients to the Muſcles: But if theſe prove ineffectual, you muſt ſtill abſtain from all Iron Inſtruments, and any other forcible Operation; and in the mean while take care by ſome other Means to provide againſt the Patient's being ſtarved for want of Food.

There are Three ſeveral Ways of providing the Patient with Food in ſuch Caſes as theſe.

Some do adminiſter nothing but liquid Aliments to the Patient, through a Funnel, Quill, or hollow Inſtrument, one End of

which they put within the Mouth, where there is a Tooth wanting; but if the Patient has all his Teeth, they beat or thruſt out One or Two on Purpoſe. Others there are who endeavour to convey liquid Aliments into the Patient's Mouth through the *Cannula*, or hollow Pipe, which being incurvated, they convey betwixt the Extremities of the Gums in the hindermoſt Part of the Mouth.

But in caſe neither of theſe Operations will take Effect, there are ſtill Two Ways left of giving Aſſiſtance to your Patient, for you may prepare Clyſters made of ſtrong Cock-Broth, or any other ſtrong nouriſhing Liquids, and adminiſter them as you do other Clyſters, which will afford Nouriſhment to the Patient: Or elſe you may give Nouriſhment to him by a Way of my own Invention, *viz.* by the Means of a Silver *Cannula*, or Pipe, which muſt be ſomewhat incurvated. This you may convey through the Noſe and the Palate into the Mouth, and the liquid Aliments through it; and upon this I look as a very good Method to ſuccour the Patient, (eſpecially if you cover the *Cannula* with a Lamb's Gut) unleſs it might be objected, that when the Food falls through the Noſe, the *Epiglottis* may be incurvated upon the *Larynx*, not without ſome Danger of a Suffocation. To tell you therefore nothing but what is abſolutely true, I muſt confeſs I never made an Experiment my ſelf of this Method; for in caſe it ſhould be attended with any Danger of Suffocation, it muſt be laid aſide, but if not, it would be of great Uſe; and whether it be attended with any ſuch Danger or no, may be tried upon a ſound Body.

Thus much concerning the voluntary Conſtriction of the Teeth, and their Cure, as in Children and melancholy Perſons; but there remains ſtill to be treated of another Sort of this Conſtriction, which is involuntary, and cauſed either by a Tumour, Defluxion, Convulſions, or any other Cauſe, and requires the Aſſiſtance of a Chirurgeon's manual Operation, in order to open the Mouth and rhe Teeth, to enable the Patient to take Food, and prevent his being ſtraved to Death. This is accompliſhed by the Help of Two Inſtruments, which muſt be very ſtrong, becauſe they muſt be a ſufficient Match againſt the forcible Motion of the Under-Jaw upwards, which, as is very well known, is of a very great Force.

The *Second* Operation belonging to the Teeth, relates to the cleanſing of them and of the Mouth from the Filth and ill Scent, which grows to them like a Bark or Rind, call'd *Oſtracederma*, which may be effected by ſmall, thin, and broad Inſtruments; which may be made alſo of Silver.

The *Third* Chirurgical Operation belonging to the Teeth, is performed upon the Teeth that are carious and hollow, which muſt be burnt, in order to ſtop the *Caries*. This is performed by the Means of a Funnel of Silver, the Extremity whereof muſt be applied to the hollow Part, through which you may convey by Drops ſome *Oleum Sulphuris* or *Vitrioli*, or ſome other proper Liquid Remedy; after which the Cure muſt be accompliſhed by thruſting Searing-Irons into the Hollowneſs; which done, you muſt then proceed to

The *Fourth* Chirurgical Operation of the Teeth, which is to ſtop the hollow Part of the Tooth with Leaf-Gold, for its further Preſervation.

The *Fifth* Chirurgical Operation belonging to the Teeth, is when we take out ſuch Teeth as are grown beyond their natural Place, either inward, and ſo prove offenſive to the Tongue, or more outward, and ſo offend the Cheeks. This muſt be performed by Inciſion, *viz.* by the Help of an Iron Inſtrument of the ſame Nature and Figure as is that which we commonly call the *Mordens*, or *Biting*: This for the External; but for the Internal, you muſt make uſe of another, of a different Shape from the former.

The *Sixth* Chirurgical Operation belonging to the Teeth, is when certain Teeth which are not ſeated in their natural Place, do ſtrike upon and prick either the Tongue inwards, or the Cheeks outwards, are taken off, which muſt be accompliſhed by a File, or an Inſtrument made like a File, to take off their Aſperities.

The *Seventh* Chirurgical Operation belonging to the Teeth, conſiſts in the drawing or pulling out of ſuch Teeth as are either looſe, painful, or rotten, and produce a ſtinking Breath. This Drawing of the Teeth

Teeth is performed by the Help of ſeveral Inſtruments, of which, before I give you a particular Account, it is requiſite I ſhould give you this Caution, That you muſt not draw the Teeth without neceſſary Precautions and previous Preparations, in order to facilitate their Extraction; for there are not wanting Inſtances of ſuch as have attempted and forcibly performed the Extraction of Teeth, without ſuch neceſſary Preparations, have, together with the Teeth, pull'd out ſometimes the whole Jaw-Bone that was rotten.

I have my ſelf ſeen more than once half of the Jaw-Bone pull'd out in ſeveral Pieces, or elſe the whole Jaw-Bone when it was rotten, and that by drawing one Tooth only.

For the Jaw-Bone, if it is once ſeized upon by the purulent Matter, does ſoon turn quite putrid, becauſe, excepting its exterior *Laminæ*, which is very thin, wherewith it is incruſtated, all the reſt is porous and ſpongious, and conſequently very apt to contract a Corruption.

The Preparation does conſiſt in this, that the Gums may be looſen'd from the Teeth by proper Inſtruments: And it is obſervable, That the Upper-Teeth are the moſt dangerous to be drawn, becauſe the Eyes and Temples may ſuffer a Concuſſion in the Operation. The Inſtruments by the Means whereof the Teeth are looſen'd from the Gums, are thin, oblong, and ſharp edged, call'd *Dentiſcalpia* in *Latin:* But for the more convenient Drawing of the Teeth, the Chirurgeons have invented and make uſe of ſeveral Inſtruments, ſome of which are of the Kind of the *Dentiſcalpia*, others like Three-forked Elevatories, and Pincers of divers Sorts: Of which, more anon.

Of the INSTRUMENTS *adapted to the Drawing of* TEETH.

COncerning the Inſtruments adapted for the Drawing of the Teeth, it is to be obſerved, That there are no leſs than Nine of them, which have obtained their Denominations partly from the Mouth, partly from the Beaks of certain Creatures, unto which they reſemble in their Figure; though generally ſpeaking, they moſt of them fall under the Denomination of Pincers.

Among theſe, ſome are adapted for the Drawing of the *Dentes Molares*, and are call'd *Pelicans*, becauſe they reſemble unto a flying *Pelican*, with the Beak turn'd inwards. They are fix'd with one of the *Baſis* to the other Teeth; and with the other, which is like the Beak of a volatile Creature, they pull out the Tooth. There are Two Sorts of *Pelicans*, which are adapted to both the Rows of the Teeth, which are either the Upper or the lower Row, to the Right or to the Left.

The next is adapted to the Drawing out of the *Dentes Inciſores*. This Inſtrument is alſo not unlike the Beak of a Bird.

The *Fourth* Inſtrument ſeems to reſemble the Beak of a Raven, and is adapted for the Extraction of the Roots or Stumps of the Teeth.

The *Fifth* and *Sixth* Inſtruments are made uſe of in the Drawing of thoſe Teeth unto which the Pelicans cannot reach at all, or at leaſt not ſo conveniently.

The *Seventh* Inſtrument is call'd the *Terebra*, and ſerves inſtead of an Elevatory or Leaver to part ſuch Teeth as are grown quite cloſe together, and upon that Account are very difficult to be pull'd out.

The *Eighth* Inſtrument is call'd the *Trifid Elevatory*, becauſe it has Three Points.

The *Ninth* Inſtrument belonging to the Chirurgical Operations of the Teeth, are the *Dentiſcalpia*, which muſt be uſed in the Firſt Place, being intended for the looſening with the more Facility the Gums from the Teeth, and the Drawing of them without any Danger of pulling away the Jaw-Bone.

There is, beſides the before-mention'd Seven Chirurgical Operations upon the Teeth, another ſtill remaining, which is occupied in repairing the Loſs of the Teeth that are fallen or drawn out, by the Subſtitution of other Teeth made of Ivory or Bone, and faſten'd together by a Golden Thread. By this Means the Defect of the natural Teeth is ſupplied in ſome Manner, for the Benefit of Eating, and the better forming the Sound of the Words.

Of

Of the CHIRURGICAL OPERATIONS *of the* PALATE.

THere is an abſolute Occaſion for a Chirurgical Operation in the Palate, when the Palate is wanting, becauſe it is eaten away. This happens either before the Birth, *viz.* when a Child is born without a Palate; in which Caſe it is not able to ſuck, and ſo dies for want of Nouriſhment, as I have ſeen it has happened; or elſe there is a Part of the Palate wanting after the Birth, becauſe, beſides the Corroſion, the Bone that is placed under it is infected alſo, which cauſes a great Deformity in the Speech, and the Victuals and Drink do ſometimes come out through the Noſe. This Diſeaſe is often a Symptom of the *French* Diſeaſe, or at leaſt follows it. The Cure is accompliſhed by putting a Spoon, or elſe a Tent of Cotton or a Plate of Silver, upon the Hole in the Palate.

The *Second* Chirurgical Operation belonging to the Palate, is when the Bone, after it is laid bare, is cauterized by thin Inſtruments of Iron, in order to ſtop the further Progreſs of the *Caries*.

Of the PANARITIUM, *or* Abſceſs *under the* NAILS. *By Monſieur* Dionis.

THE *Panaritium* is by the *Greeks* call'd *Panorichia*, from the Word *Para*, *i. e.* againſt, and *Onyx*, which ſignifies a Nail, being a Tumour which ariſes at the Extremity of the Fingers, juſt by the Nails, and is cauſed by an acrious, burning, and corroſive Humour, which corroding the *Periоſteum*, the nervous Filaments, and the Fleſh, produce an *Eſcar*. It may be eaſily diſcovered by its exceſſive Tenſion, Pulſation, acute Pain, and burning Heat, being always accompanied with a burning Fever.

The Ancients have diſtinguiſhed this Tumour into Two Sorts, *viz.* that where the Matter is contained betwixt the Skin and the *Perioſteum*, and the other where the Matter lies betwixt the *Perioſteum* and the Bone. But this laſt ſeems to be only imaginary, it being abſolutely impoſſible that ſuch a Quantity of Matter as comes from it ſhould be contained within ſo ſlender a Place, which is ſcarce Two Lines broad. 'Tis therefore always fix'd betwixt the Skin and the *Perioſteum* at the Extremity of the Finger; and when the Bone is lain bare, 'tis a Sign that not only the *Perioſteum* is corroded by the acrious Matter, but alſo the Ligaments which tie the Bone of the Third *Phalanx* to the Second, which makes the Bone fall out by Suppuration. Among all the Apoſthumes, the *Panaritium* is the moſt painful, for the Extremity of the Finger being uncapable of extending it ſelf ſo far as the Quantity of the Matter does require, this cauſes an exceſſive Tenſion and intolerable Pain, which being increaſed by the Corroſion of the Matter, which acts upon the Extremities of the Nerves that meet together in that Place, does produce ſuch exceſſive violent Pain, as affords the poor Patient ſcarce a Moment's Reſt.

Theſe Tumours muſt with all poſſible Speed be brought to a Suppuration by maturative Remedies of the ſtrongeſt Sort, as the *Oſeille*, the Roots of *Lillies*, Leaven, Pigeons Dung, and the *Baſilicon*. You muſt apply theſe Things in Form of ſmall Cataplaſms, and often put on freſh Ones, the exceſſive Heat of the Part being ſoon apt to dry them up. Sometimes a Gangrene does enſue, becauſe the Arterial Blood is intercepted in its Return by the exceſſive Tenſion of the Part; and for this Reaſon it is, that you muſt open this Tumour, the ſooner the better, without ſtaying for to feel a Fluctuation in the Part, as well to prevent a Mortification, as to give Eaſe to the Patient as ſoon as poſſibly may be.

Take therefore the Lancet, *G.* which muſt be larger than that made Uſe of in Bleeding;

with this you muſt make a longitudinal Inciſion on the lateral Part of the Finger, leſt, in caſe you ſhould make it in the middle Part, you ſhould prick the Tendon; and though after the Tumour is open'd there comes forth nothing but a Seroſity and Blood, the Patient is nevertheleſs much eaſed by the Diſcharge of the Matter, and by diminiſhing that exceſſive Tenſion that was there before, and by opening a Way for the Matter, after its Concoction, to iſſue forth by Degrees.

After the *Panaritium* is open'd, you muſt nevertheleſs not ceaſe to apply maturative Remedies; and whenever you judge the Cataplaſms no farther neceſſary, you muſt apply to the Aperture a Pledget, *H.* covered with the *Baſilicon*, and over that an *Empl. Diachil. cum Gumm. j.* ſhaped in the Form of a *Maltheſe* Croſs, to further the Suppuration. Put over this a Compreſs of the ſame Figure, and over that a ſmall Band, wound round about, and tied together at the upper End of the Finger; which afterward you muſt put in a Finger-Caſe, *M.* made of Leather on purpoſe, with Two Strings, to it, to faſten it to the Wriſt. Afterwards put the Hand in a Muff, or Furr'd Glove; for by keeping it warm, you will accelerate the Coction of the Humour, and then keep the Hand in a Riband or Scarf, bent ſomewhat higher than the Elbow, leſt in caſe it ſhould hang down, a Defluxion might fall upon the affected Part.

The next Day you will moſt commonly find the Fleſh to ſtick out beyond the Inciſion; for this Fleſh being over-moiſten'd by the Humours, and preſs'd hard by the ſmall Compaſs of the Finger, opens its Way thro' the Aperture that has been made in the Skin. It is commonly of a livid Colour, and will ſometimes be conſumed by the Suppuration; but if it is not, and ſtops up the Orifice of the Wound, you muſt cut it off with the Siſſars, which is done all at once, and much ſooner than if you go about to cut it away by Cauſticks.

When the Matter has corroded the *Periоſteum*, the Bone of the laſt *Phalanx* muſt of Neceſſity exfoliate; and this Bone being but ſmall, it oftentimes falls quite out, which cannot be done without the Extremity of the Tendon which was faſten'd to it be ſeparated from it, and corrupted or altered by the ſame Humour. Nature will bring about this Separation of the corrupted Part of the Tendon from the ſound, by the Aid of ſome balſamick and ſpirituous Remedies, which muſt be conveyed within the Wound, and then you muſt leave off the *Empl. Diachil.* and inſtead thereof apply the *Unguent. Divin.* by the Help of which you may accompliſh the Cure of this cruel Diſeaſe.

Of the Vitious Excreſcency of the NAIL *of the Great Toe. By the ſame Author.*

THE Nail of the Great Toe will grow ſometimes on both Sides into the Fleſh, and cauſe a continual Pain, ſo that the Party is not able to walk; and where this Nail is fix'd into the Fleſh there will ariſe an Excreſcency, which ſometimes grows almoſt over the Nail. This Excreſcency they take away by Degrees with the Powder of burnt Alum, apply drying Plaiſters, and thus endeavour to procure a Cicatrization, but all in vain, as long as the Points or Edges on both Sides of the Nail ſtick in the Fleſh, which being become entraneous Bodies by their exceſſive ſharpneſs beyond their natural State, and by their painful Preſſure upon thoſe Parts, muſt be taken away before you can hope for a Cure.

This Inconveniency is occaſioned alſo when the Lining of the Shoes being too hard preſſes upon the Great Toe, and ſo makes one or both Sides of the Nail grow into the Fleſh; for this continual Preſſure againſt the Soal makes the Nail extend it ſelf, and grow in Breadth into the Fleſh, which at firſt Sight ſeems to be but a very ſlight Indiſpoſition, but thoſe that are afflicted with it feel an almoſt inſupportable Pain; and therefore ſuch Perſons as have the Nail of the Great Toe thick and hard, ought above all

all Things to forbear the Wearing of ſuch Shoes.

All the Remedies belonging to Chirurgery are not ſufficient alone to cure this Indiſpoſition, without the Aid of manual Operation, there being no other Way than to cut off entirely that Part of the Nail which has enter'd into the Fleſh: For which Purpoſe you muſt firſt of all hold the affected Foot in warm Water for ſome Time, to ſoften the Nail that is to be cut: Then place the Patient upon a Chair, which muſt be higher than that upon which the Chirurgeon is to ſit, who having taken his Place directly oppoſite to the Patient, with a Napkin ſpread over his Knee, he orders him to put his Foot upon it, and then with the *Biſtoury*, *A.* made in Shape of a *Ganif*, he cuts off lengthways that Part of the Nail which is grown into the Fleſh, then takes hold of it with the Pincers, and draws it gently, for fear of cauſing too much Pain if he ſhould do it violently, or at once; and in caſe he finds it to ſtick too cloſe, he muſt ſeparate it gently from the Fleſh before he pulls it out.

I look upon the Siſſars, *C.* more commodious for this Operation than the Knife; and I have often cut off theſe Pieces of Nails with them, by putting one of the Points of the Siſſars under, and the other above the Nail, ſo I cut on gradually till I come to the Root; and having thus ſeparated the ſuperfluous Part from the reſt, I pull it out without any Violence.

This Operation, as ſlight as it ſeems to be, is very painful; but the Chirurgeon muſt endeavour to do his Buſineſs as quick as he can; for ſo ſoon as the Piece of the Nail is taken out, the Pain ceaſes.

Unto the Place where the Nail has been cut away, you muſt apply one of theſe ſmall *Bourdonnets*, *D, D.* ſoak'd in ſome Lime-Water, or ſome other drying Water, an Emplaiſter *de Ceruſſ.* or *de Minio*, *E.* a Compreſs, *F.* and a ſmall Band, *G.* which you muſt wind round the Toes ſeveral Times. You muſt adviſe your Patient to keep his Foot quiet without Walking for ſeveral Days after, for fear of an enſuing Defluxion upon the Part. You muſt dreſs it every Day till you have procured a Cicatrization, which may fill up the Place where the Nail has been cut out. If any ſmall Excreſcencies of the Fleſh happen to ariſe, you muſt take them away with burnt Alum.

'Tis not ſufficient to have cured this Indiſpoſition for the preſent, unleſs you take Precautions alſo againſt its coming again, which it will certainly do, when the Nail begins to grow again. The beſt and ſureſt Way to prevent this Recidive is to raſp or ſcrape the Nail once a Month with a Piece of Glaſs, and thus raſp it very thin till you find it begin to touch to the Quick. This is Matter of Fact, founded upon Reaſon and Experience; for the Nail being weaken'd in its middle Part, the Two Sides do draw towards the Center, and conſequently from the Fleſh: Beſides that, the nutritious Parts of the Nail are employed in repairing that Part which was taken away by the Glaſs, and not on the Sides, where it uſed to impair the Fleſh.

Of the CHIRURGICAL OPERATIONS *to be performed upon the* NAILS *of the Hands and Feet; but more eſpecially of the Excreſcency of the Fleſh over the Nails, and Growing of the Nails of the Great Toe downwards into the Fleſh. By* Fabricius ab Aquapendente.

SOME reckon the Paring of the Nails, as well as the Scraping of them when they are rugged on their ſuperior Surfaces, among the Chirurgical Operations; but theſe being at the beſt only for Ornament's-Sake, ſcarce can challenge any Place here, and therefore we confine our ſelves to the other Two manual Operations made upon the Nails in the *Pterigium*, or *Paneritium*, which is an Excreſcency of the Fleſh over the Nails, and to the other, which is when the Nail of the Great Toe turns and grows downwards into the Fleſh.

The

The *Pterygion*, or *Paneritium*, is by the true Latiniſts call'd *Reduvia*, and is an Excreſcency of the Fleſh which covers Part of the Nail, and is moſt commonly incident to the Thumb and Great Toe, and proceeds either from a Defluxion, or ſometimes alſo from an external Cauſe; for if the Great Toe be offended by ſome external Cauſe it will go into an Inflammation, next into a Suppuration, and when the Nail begins to putrefy by the purulent Matter, there follows an Excreſcency of the Fleſh; and unleſs timely Care be taken, it will by Degrees cauſe a Corruption, not only on the Nail, but the Bone alſo which ſupports the Nail; in which Caſe the Toe will be inflamed at its Extremity with violent Pain, an ill Scent, and livid Colour.

The Women are uſed at the Beginning, as ſoon as they perceive any Pain in the Toe or Thumb, but before it begins to ſwell or turn red, to dip its Extremity Three or Four Times in hot boiling Water, but ſo as that the Toe or Thumb but juſt touches the Water, by which Means that little Quantity of Matter that is gathered there is diſperſed, juſt as *Celſus* adviſes us to apply Cupping-Glaſſes with Scarrification to an Abſceſs, to draw out the Matter; but in caſe the Defluxion be ſtrong, then Recourſe muſt be had to more potent Remedies.

For in caſe the Nail is already gone into a Putrefaction, we muſt proceed to a manual Operation, which is to cut out the Nail with a Pair of Siſſars, or a Knife; After which you muſt cauterize the overgrown Fleſh, and the whole Part, as far as it is ulcerated, with a ſmall but very hot Iron.

If the Corruption has reach'd to the Bone, then there is more Occaſion than ever for the Application of the Searing-Iron, which muſt be often repeated, or at leaſt as often as you find there is Occaſion.

As to the Second Affection, when the Bone and the Nail do remain ſound, but there is an Excreſcency of the Fleſh in the Corner of the Nail, becauſe it turns downwards, and grows into the Fleſh, with Inflammation, and an almoſt inſupportable Pain. In this Caſe, *Albucaſis*, and ſome others, adviſe us to lift up the Nail with the *Specillum*, then cut away the ſuperfluous Fleſh, and conſume the reſt with Corroſives.

I uſed to cure this Affection in the following Manner: I ſeparate firſt of all the Nail from the Fleſh with the *Specillum*, and after that, by thruſting ſome dry Pieces of Linen Cloth cloſe betwixt the Nail and the Fleſh, in order to part and dilate them aſunder.

This done, I cut Part of the Nail aſunder with my Siſſars lengthways, *viz.* as far as it ſticks into the Fleſh: Then I take hold with a Pair of Tweezers of that Part of the Nail which is cut aſunder, and pull it off from the reſt without any Violence. The ſame Operation I repeat every Day, by Dilatation, Inciſion, and Pulling it away, till that whole Part of the Nail which is grown into the Fleſh, is cut and taken away by Degrees.

There are ſome who take off the Nail by the Help of a cauſtick Medicine, which I do not very well approve of, becauſe the Cauſtick may infect the Tendons, and cauſe a Gangrene.

A TRACT concerning DISTEMPERS *in General. Taken out of Monſieur* St. Hilaire's *Anatomy of the Humane Body, and its Diſeaſes.*

AS Health is the Foundation of Life, ſo a Diſeaſe is the Deſtruction of Health. Health does conſiſt in a juſt Diſpoſition and Conſtitution of all the Parts that compoſe the Machine of the Body, which puts it in a Condition to act according to the Laws preſcribed by Nature; as the Diſeaſe, on the contrary, takes away that natural Diſpoſition and Conſtitution.

The Subject as well of Health as of Diſeaſes is the humane Body, but in different Reſpects according to its Parts. The contained Parts, *viz.* the Blood and Spirits, which approach neareſt to the Root of Life, are the principal Subject; as the ſolid or containing Parts are the ſubordinate or leſs principal Subject.

The Life does conſiſt, or is lodged radically and principally, in the Blood and Spirits; whereas in the ſolid Parts it is only by Determination, *i. e.* the ſolid Parts participate only of Life, as far as they are enliven'd by the Influx of the Blood and the Spirits.

In internal Diſeaſes, which owe their Origine to Nature, and to the peccant Matter and Humours, there are Two Sorts of Subjects, *viz.* the *Subject of Inheſion*, and the *Subject of Radication*, as well in regard to the efficient as to the material Cauſe.

The Part where the Firſt makes its Appearance in particular by ſome Motion or Effect *contra Naturam*, is call'd the Subject of the Diſeaſe.

The Part which is firſt occupied by the material Cauſe, either in its Firſt Origination, or in reſpect of its Diſtribution, is the *Subject of the Cauſe*, or the Firſt *Spring of the Diſeaſe.*

Thus in an *Epilepſy*, cauſed by the vitious Diſpoſition of the Spleen, the *next efficient Cauſe* is the impetuous Motion of the Animal Spirits, which produce the convulſive Epileptick Motions; the Fibrous Parts, which receive the Motions *contra Naturam* of theſe Spirits, are the *Subject of Inheſion*; the acrid Matter, which by its acuminate Particles does excite this impetuous Motion, is the *Material Cauſe*; and the Spleen, which contains this Matter, is the *Spring* or Subject of the *Radication.*

In the ſame Manner it happens in the Stomach, which, when over-charged with Wind, produces a Giddineſs in the Head. Here the Stomach is the *Subject of Radication*, or the Spring of the *Vertigo*; and the Head together with the Spirits incloſed within its Compaſs, are the *Subject of Inheſion.*

When the material Cauſe ſeizes upon the ſame Part which is affected with the Diſeaſe, the Diſeaſe is called *Eſſential*; but whenever the material Cauſe occupies one Part, and the Diſeaſe another, this is call'd a *Diſeaſe by Conſent.*

The Differences of the Diſeaſes ariſe either from the Diverſity of the Subject, or from the Concourſe of Circumſtances: The firſt are eſſential, and the latter accidental.

There are Three eſſential Differences of Diſeaſes, *viz.* thoſe of the Spirits, thoſe of the Humours, and thoſe of the ſolid containing Parts.

The *Diſeaſes of the Spirits*, either implanted or flowing into the Parts, do happen when they go aſtray, or vary from their natural and juſt Conſtitution, ſuch as is adapted to the Government of the Body.

The *Spirits* deviate from their natural Conſtitution Three different Ways, according to *Etmuller*, *viz.*

Firſt, In *Reſpect of their Quantity*, when they are not ſufficient in Quantity to move the Body and all its Parts; as it happens to the *Spirits* that flow upon the Parts after exceſſive Faſting or Exerciſes, or Evacuations and Hemorrhagies; for thereby the Body is rend-

render'd languid, the natural Strength is impaired, and the vital Operations are interrupted for want of a ſufficient Supply of Spirits.

As for the *implanted Spirit*, it is weaken'd and diminiſhed ſucceſſively: It is ſpent and conſumed in Wounds, Ulcers, Colds, or the Palſies of the Members; after which they remain much more weaken'd than before.

Secondly, In *Reſpect to their Quality or Subſtance*, the Spirits which flow into the Parts, deviate from their natural Conſtitution when they are progenerated with ſome vitious Quality; as it happens in the Scurvy and in the confirmed *Malum Hypochondriacum*; or elſe when they are infected after their Generation by ſomething of a malignant Nature, as it happens in the Plague, or by the taking of *Opium*.

Thus the *Implanted Spirits* loſe their natural Conſtitution, and ſometimes tend towards a total Deſtruction in a Gangrene.

Thirdly, In *Reſpect of their Motion*, that of the Spirits flowing into the Parts is either Elaſtick, or Irradiative.

The Firſt is impaired in general by narcotick and ſomniferous Remedies; and as the Irradiative Motion has a Dependance on the former, it muſt of Neceſſity ſuffer a Diminution in ſome Meaſure.

This laſt is ſometimes vitiated alone; as for Inſtance, in Contuſions.

'Tis manifeſt, That the Animal Spirits cannot perform the Animal Function by the Means of Motion. The Spirits which flow into the Parts are apt to ſtagnate, or to move too ſlowly, whenever they are not ſufficiently ſubtiliſed or volatiliſed, whether they have received this ſlow Motion from ſome internal Cauſe, as in a *Lethargy* and *Catalepſy*, or from ſome external Cauſe, as by the Uſe of Narcoticks, or *Opium*.

Sometimes on the contrary they are too light and volatile; ſo that upon the leaſt Occaſion they fly out into impetuous and exorbitant Agitations; as it happens in the *Deliriums*, occaſion'd by Fevers; in Frenſies, and Epilepſies.

This vitious Diſpoſition owes its Origine moſt commonly to ſome accidental Cauſe, and that ſometimes to ſuch an one as is of little Moment in it ſelf, yet ſuch as irritates ſome very ſenſible Fibres by a very acute Impreſſion.

Thus the acuminated Particles of the Antimony, though never ſo ſmall, cauſe an Irritation of the Spirits in the Stomach, and conſequently violent Vomitings. And thus the Stone or Gravel in the Kidneys, by pricking or irritating the Nervous Fibres, throws the Spirits into a contra-natural Motion; upon which enſue a Cholick, Obſtructions or Conſtipations in the *Lower Venter*, a Nauceating of Aliments, and oftentimes Vomiting alſo.

The *Implanted Spirit* deviates in its Elaſticity, and Motion of Colliſion or Fermentation with the Spirit that flows into the Parts, by Three different Ways, according to the ſame *Etmuller*.

Firſt, *By its Augmentation*, when the Spirit that flows upon the Parts falls with Violence thither, there ariſes a too violent and precipitate Fermentation, which produces a Redneſs, Heat, Tumours, and ſuch-like other Symptoms in the Parts, which by *Van Helmont* are aſcribed to the *Irritated Archæus*.

Secondly, By its *Diminution*, as we ſee it happen when People are ſtupified with Cold, in aged Perſons, and ſuch as are near Death, *&c.* as alſo in exceſſive Frights, when the Irradiation of the Spirit that flows into the Parts being ſtop'd, the Motion of the implanted Spirit is interrupted alſo, which of Neceſſity produce Cold, Tremblings, and Stupefactions.

Thirdly, By its *Depravation*, when the Nutrition of the Parts is vitiated, or their Conſtitution impaired.

Unto the Diſeaſes of the Spirits muſt be referred alſo thoſe which by *Van Helmont* and *Marcus Marci* are call'd the *Archæales*; for as the Spirits are determined by the Seminal *Idea's* in their natural Operations, as well relating to the Structure as the natural Uſe of the Parts, they are in the ſame Manner determinated by the vitiated, foreign, and morbifick *Idea's*, which they either receive from abroad, or frame themſelves by ſome Occaſion or other, and there produce contra-natural and morbifick Actions; ſo that the material Cauſe of theſe Diſeaſes conſiſts partly in the Spirits that flow into the Parts,

or elſe in the implanted Spirit, and the formal Cauſe in the vitiated *Idea*, which determines the Spirits to ſome contra-natural Action.

Thus the *Idea* which the Mother conceives in her Imagination, determines the Spirit Architect to form the *Fœtus* in a different Manner from what the Seminal *Idea* has determined it to be; and thus, as often as in the Formation of the Parts, there are repreſented to the *Archæus* ſome new *Idea's* more ſtrong than the Seminal Ones, deſigned for the Uſe of the Parts, the Spirit is determin'd by the former to act againſt Nature, whether theſe morbifick *Idea's* do ſupervene from abroad; as for Inſtance, from ſome Poiſon, Narcoticks, by the Stings or Bitings of venemous Creatures, or a mad Dog, *&c.* or that they have their Riſe from within, and that the *Archæus* being diſturbed by ſome accidental Cauſe, conceives ſeveral diſorderly *Idea's*, as of Indignation, Fury, Fear, *&c.* which impart to it a vitious Direction in its Action.

Thus the Biting or Slabber of a mad Dog makes the Perſon that is wounded ſo mad, that he not only actually imagines himſelf to be a Dog, but alſo performs all the Actions of that Creature: Beſides that, even in his Urine there are to be ſeen the Images or Figures of little Dogs, which is owing to the Seminal *Idea's* of the mad Dog, imprinted in the Slabber, which are communicated to the Body of the Perſon wounded by the Dog.

Theſe *Idea's* are confuſed at firſt, but become regular in Time, and determine the *Archæus*, or the implanted Spirits, to ſuch Actions as are like unto thoſe of Dogs.

Experience has taught us how to efface theſe foreign *Idea's*, and by Conſequence to cure the Party of his Madneſs, by throwing him unexpectedly into the Water, and leaving him there for ſome Time; for the Dread of Death, and the *Idea* which is framed by it, being much ſtronger than the foreign *Idea's*, do efface and raſe them out in ſo effectual a Manner, that for ever after they do not give any Determination to the *Archæus*.

The *Diſeaſes of the Humours contained* are the *Plethora*, and the *Cacochymia*.

The *Plethora* of the Blood is of Two Sorts, *viz.* either *true*, or *apparent*.

The *true Plethora* is when there is too great a Quantity of Blood in the Veſſels for its Circulation.

The *apparent Plethora* is when the Blood is ſwell'd by an Effervescency in a Fever, or ſome other Cauſe, (like when the Wine ferments in a Veſſel) diſtends the ſanguineous Veſſels, is hurried on with a very rapid Courſe, and a quick and ſtrong Pulſe, which produces Inflammations, if it be check'd or ſtop'd, or Hemmorrhagies, when theſe Veſſels ſuffer a Diſruption.

Of this Kind is the Effervescency or Fermentation of the Blood which happens to Women every Month; after which they purge off Part of it by the Way of their Genital Parts: And if ſo it happens that they do not pay this Tribute every Month, and ſend it forth through the Parts deſign'd for that End, the Blood will often open its Way ſomewhere elſe, as through the Noſe, the Breaſts, Vomiting, through the Corners of the Eyes, through the *hemorrhoidal Veins*, *&c.* of which there are many Inſtances.

The *Cacochymia* is when the Humours are vitiated in their natural Texture, or in their Fermentation.

The *Cacochymia of the Texture* is when the *acid* and the *urinous* Part, which are the very Soul of it, are diſtemper'd; as its natural Conſtitution is their true Temperature.

The *morbifick Acid* is of different Sorts in the Body: Sometimes it is fix'd and aigre; it is leſs or more implicated with terreſtrious Particles; and at other Times it is volatile and oily, *i. e.* it is leſs or more intermix'd with a ſubtile *Alcali*. Thus the acid is fix'd in the *Malum Hypochondriacum*, but volatile in burning Fevers.

Thus it is likewiſe fix'd in the Intermittent Fevers or Agues, where, from its State of Fixity, it turns into that of Volatility in the Paroxiſm; which is the Reaſon why the Intermittent Fevers are ſometimes changed into Continual.

To be ſhort, what is commonly related of the Bile and bileous Conſtitutions, who abound with a volatile, oleaginous *Alcali*, muſt be underſtood of the volatile Acid impregnated more or leſs with the *Alcali* und

under an oleaginous Vehicle. When this Acid is too much exalted, the Acrimony of the *Bilis*, and the bileous Diſeaſes, are progenerated by it.

As the *Plethora* proceeds from the Blood, the *Pituita* comes from the Chyle, and the *Cacochymia Pituitoſa* from the Chyle that is vitiated.

The *Bilis* is compoſed of an oleaginous volatile Acid, leſs or more charged with a volatile *Alcali*; and the *Bilis* when vitiated produces a *Cacochymia Bileoſa*.

The Melancholy owes its Origine to a fix'd Acid, impregnated leſs or more with terreſtrious Particles; and the Melancholy when it is vitiated produces what we call a *Cacochymia Melancholica*.

The *Cacochymia Bileoſa*, or the oleaginous volatile Acid is charged leſs or more with a *volatile Alcali*, theſe being the Elements that make up the Compoſition of the natural Bile, intended to be a Balſam to the Body, becomes vitious, either in Reſpect of its Quantity, as for Inſtance, when there is too much or too little of it, or elſe in Reference to its Quality, when this Humour is either too acrious, or not at all ſo.

It is render'd too acrious by the ſaline Particles, but more eſpecially by the *Acido-ſalina*, abounding in too great a Quantity; or when they are expanded by too great a Quantity of oleous volatile Particles, whereby the Bile being too much ſubtiliſed, is render'd too volatile, as may be obſerved in the diſtill'd aromatick Oils of the Vegetables.

But the Bile may be deſtitute of its natural Acrimony for want of the ſaline, volatile Particles, and by the too great a Quantity of an oleous, aqueous Subſtance, which being not ſufficiently volatiliſed, renders the Bile unactive, and ſlow in its Motion; as may be obſerved in the Oils of the Vegetables, drawn by Expreſſion, or by Infuſion.

The *Cacochymia Melancholica*, or the Acid, when it is too much fix'd, performs its Action upon the Blood, either by introducing a total Coagulation, or a Seceſſion, or a Diminution, or elſe a Depravation in its Fermentation.

Thus if it affects the *Lympha*, it produces Pains in the fixed Parts, or Ulcers, or ſcirrhous Tumours, by the Coagulation of the Juices, which going into an Effervescency, may eaſily degenerate into a Cancer.

In caſe the ſame Acid corrupts the Pancreatick Juice, it will cauſe Pains and Excoriations in the Inteſtines, a Dog-like *Fames*, or Appetite, a *Nauſea* of Food, *&c.*

Laſtly, the *Cacochymia Pituitoſa*, or the immediate vitious Diſpoſition of the Chyle, owes its Origine to the depraved Ferment of the Stomach, which is either impaired or weaken'd, or elſe too ſowr, or elſe too fixe; which hindering the Digeſtion of the Aliments, theſe degenerate into a viſcous, terreſtrious, tenacious, and ſometimes acid Matter, for want of its proper Volatility.

This viſcous Chyle not only encreaſes the tough Slime wherewith the Stomach and Inteſtines are inveſted, but alſo that Part of it which is carried into the Maſs of Blood, being incapable of being aſſimilated, or turn'd into Nouriſhment of the ſolid Parts, and conſequently the active Principles of the Maſs of Blood being check'd, and the whole Maſs becoming terreſtrious and thick, is not capable of fermenting, nor performing its Circulation with that Swiftneſs as it ought to do.

All this while the Chyle it ſelf being by its Viſcoſity detain'd in the Pores of the Parts, towards the Capillary Veſſels, it fills up the *Viſcera* as it were with a ſpongeous Matter, and by Degrees being quite congulated by its own Acidity, degenerates into a *Scirrhus*: And theſe Diſeaſes prove the more troubleſome, the more the Maſs of Blood is infected with theſe chylous and acid Particles, which give Birth to abundance of Chronical Diſeaſes, but more eſpecially to *Cachexies*.

The modern Phyſicians have added unto theſe a Fourth Sort of a *Cacochymia*, called the *Seroſa*, which has its Origine from the aqueous Humour, which is the common Vehicle of the Excrements and the Aliments. Whenever this Humour is defective, all the contained Humours are vitiated in their Conſiſtency; as on the contrary, when there is too much of it, they become too fluid.

This proves the Occaſion of divers Diſeaſes, eſpecially if the *Serum* be infected with ſome vitious Humour, and ſome acrious, ſaline, and acid Particles. The laſt of theſe, as it is the worſt, ſo it is the moſt frequently ſeen: For from hence take their

their Riſe ſeveral Affections of the Urine, and Diſeaſes cauſed by Defluxions, eſpecially if there be a vitious Diſpoſition in the *Lympha* of the Glandules.

The Fermentation of the Blood, if vitiated and interrupted by the Diſproportion of the acid and urinous Salts, does produce almoſt innumerable Diſtempers in the humane Body.

If it be by Diminution, it will be enſued by almoſt numberleſs Chronical Diſeaſes, *Cachexies*, Leucophlegmaticks, and *Anaſarca's*; for when the Spirits are not exalted, nor well proportioned as they ought to be, all the Actions become languid, a Sort of Heavineſs ſeizes upon the Members, the nutritious Juice which is conveyed thither does degenerate into a viſcous Jelly, which the Ancients call'd the excrementitious *Pituita*; and laſt of all there follows a dangerous Seceſſion and grumous Coagulation of the Blood.

If it be by Abolition, whether a ſudden or ſucceſſive, you muſt expect nothing leſs than *Syncopes*, Loſs of Strength, and Death it ſelf.

If by Augmentation, the Body is put into an exceſſive Heat, the Motion of the Blood is very rapid, and we are ſeized with Inflammations, Inquietudes, Burning Fevers, Small-Pox, and other ſuch-like Diſeaſes.

If by Depravation, Hiſterick Affections, Scurveys, *French* Pox, and ſuch-like Calamities, will enſue in great Numbers.

The Diſeaſes of the ſolid Parts may be diſtinguiſh'd into Three Sorts, *viz.* the Diſeaſes of *Intemperature*, the Diſeaſes of *Conformation*, and the Diſeaſes of *Compoſition*.

The *Diſeaſes of Intemperature* are thoſe where the ſenſible Qualities of the Parts, as the Softneſs, Hardneſs, Viſcoſity, Colour, and Conſiſtency, in which conſiſts their Firſt or Elementary Temperament, and which depends on the different Conſtitution of the Blood, undergoes an Alteration by the vitious Nutrition of the ſame Parts.

The *Diſeaſes of Conformation* are when the organick Parts are vitiated in their Three different Dimenſions. Thus the Length of a Part may be vitiated in a ſtreight Line, and then the Part will be too long or elſe too ſhort; or alſo in a curved Line, and then there will be an ill Figuration of the Part. If the Part be vitiated in its Breadth it will be either too thick or too ſlender; and if it be vitiated in its Depth, or leſs or more porous or ſolid, the Diſeaſes of the Cavities and of the Conduits will enſue, but eſpecially Obſtructions.

The *Diſeaſes of Compoſition*, or the *Solution of Unity*, are when the Continuity of the Parts, and their due Situation in Reſpect to each other, is render'd vitious, as in Wounds, Ulcers, Luxations, and Fractures.

Of the *accidental Differences of Diſeaſes* there are a vaſt Number, becauſe they depend on thoſe Circumſtances that have a Relation to the Cauſes, the Subject, the Symptoms, the Time, Place, *&c.* which are almoſt numberleſs.

The *Firſt* among theſe Circumſtances is the Manner of being affected by a Diſeaſe, in Reſpect to which the Diſeaſes are call'd *Contagious* and *Epidemical*.

The *Second* is the affected Part, in Reference to which the Diſeaſes are diſtinguiſh'd into *Eſſential*, and thoſe by *Conſent*.

The *Third* is its Firſt *Origine*, in Regard to which the Diſeaſes are either *Hereditary* or *Adventitious*.

And the *Fourth* is the *Quality* of the *morbifick Cauſe*, in Relation to which, the Diſeaſe is either of a benign or a malignant Nature.

Contagious and *Epidemical* Diſeaſes are of the Kind of the fermentative Diſtempers, and owe their Origine, according to *Etmuller*, to certain fermentative Influxes, which being mix'd with the Maſs of Blood, and the other contained Humours, do there exert their Tragical Effects.

A *Contagion* is call'd when this Ferment being exhaled or proceeding from a ſick Perſon, is communicated to another, where, by introducing a new Fermentation, it produces the ſame Diſtemper.

An *Epidemical Contagion* is when theſe Exhalations are received together with the Air in Inſpiration, or with the Aliments in Deglutition, and afterwards produce a vitious Fermentation.

The *Contagious Exhalation* is not unlike unto the Leaven of the Bakers, which they take from a Maſs of fermented Paſte, and make uſe of it for the Fermentation of ano-

ther Maſs of Flower; as the *Epidemical Contagion* reſembles unto the Influx or Influences occaſioned by the Vines when they are in Bloſſom, which will occaſion a Fermentation and muddy Conſiſtency in the Wines even in the Cellars.

The *Firſt* of theſe Two is nothing elſe than the vital Spirit, either the *implanted*, or that which flows into the Parts, vitiated and altered, which communicates the ſame vitious Diſpoſition and Alteration to another Subject of the ſame Nature: For though the contagious Ferment is very active, it nevertheleſs does not communicate its Infection but to Subjects of the ſame Kind, but more eſpecially to thoſe of the ſame Family. It is communicated in ſo ſmall a Quantity, as to be imperceptible to our Senſes, and never makes its Appearance but by its dreadful Effects, all which muſt needs proceed from a Spirituous Matter. And as it does not act but upon Subjects of the ſame Kind, there muſt of Neceſſity be a great Congruity betwixt it and the vital Spirits of thoſe Subjects, and conſequently it muſt be of the ſame Nature with them.

Two Things therefore fall more eſpecially under our preſent Conſideration, in Reference to contagious Diſeaſes, *viz.* the morbifick Leaven, or Ferment, and the vital Spirit, either the implanted, or which flows into other Parts, which is its neareſt or immediate Subject. This laſt not only conſtitutes the Eſſence of the contagious Diſeaſe, but is alſo the Cauſe why this Diſeaſe does not ſeize upon any other, but upon Creatures of the ſame Kind. Thus the contagious *Dyſenteries* in Camps only ſeize upon the Men, but not upon Dogs nor Horſes. Thus a Plague or contagious Diſeaſe which happens among the Sheep does never ſeize upon Men, nor upon any other Animals.

In caſe this malignant Ferment is lodged in the implanted vital Spirit, and in caſe its Exhalations are ſent forth from ſome certain determined Part, either immediately by inſenſible Tranſpiration, or mediately with the Excrements, ſo that they are determined rather to one Part than another, by Reaſon of the implanted Spirit, which ſerve them inſtead of a Vehicle, it will certainly happen, that this contagious Ferment will ſeize only upon one certain Part, but not indifferently upon any others. Thus we find the Inteſtines only affected in contagious Dyſenteries, the Throat in Quinſies, and the Skin in the Itch.

In caſe this malignant Ferment is lodged in the Spirits that flows into the Parts, the whole Maſs of Blood will then participate of the Infection, and will produce an univerſal, and not a particular Diſeaſe, ſuch as may be obſerved in the Small-Pox, Spotted-Fevers, and other Diſtempers of a malignant Nature.

Thus in the Dyſentery, the malign and contagious Ferment is nothing elſe but an acrious volatile Acid, which having the implanted Spirit of the Inteſtines for its Vehicle, certain Particles which are ſeparated from it are extruded with the Excrements; and theſe eaſily aſſociating themſelves in another humane Body with the ſame implanted Spirit of the Inteſtines, and making as it were one Body, produce ſuch another Dyſentery, *i. e.* a particular contagious Diſeaſe.

On the contrary, in the Small-Pox, the Spirit that flows into the Parts being infected with the contagious Ferment, produces an univerſal contagious Diſeaſe, which imparts its Infection to the whole Body, and all its Parts, as well internal as external, in lieu; that in the Itch, where the implanted Spirit of the Skin is infected only, there enſues no more than a particular Diſeaſe of the Skin.

Theſe morbifick Exhalations are all of them of a ſaline Nature, which *Simon Pauli* refers to the volatile Salts. They are not all of them of the ſame Nature, nor have the ſame Qualities.

Some of them participate of the acrious, volatile Acid, as thoſe corrupted Exhalations proceeding from dead Bodies after a great Defeat, and which produce peſtilential Fevers. Some others of them have their Riſe from a ſpecifick Acid, as thoſe in the Epidemical Dyſenteries, in the Small-Pox, and in the *French* Diſeaſe.

Neither are theſe morbifick Ferments all of them of the ſame Activity; for ſome of them ſoon diſcover themſelves by their malign Effects, as in malignant Fevers; others not till ſome Time after, as in the *French* Pox,

Pox, the Itch, ſome are more, others leſs pernicious.

One of the main Reaſons of this Difference is the Diverſity or Congruity of the Subjects, in reſpect to the Temperature and Contexture of the Maſs to Blood; and as this Congruity is moſt commonly obſervable betwixt the Parts, hence it is, that ſome of them are more apt to receive the morbifick Exhalations than others.

The Madneſs of a Dog has ſomething in it that is very particular, becauſe its Contagion will lie concealed in the Body without Action, even for ſome Years after the Perſon has received the Bite from the Dog; and the more, in that in this Caſe certain contagious *Idea's* ſeem to tranſplant into the *Archæus* of the Perſon that has been wounded by the Dog, certain Dog-like Actions.

The *Tarantiſme* is of this Kind alſo, for here the contagious Seed remains always idle and unactive, and is not revived or put in Action till at that very Time when the Bite was given by the *Tarantola*.

A *Diſeaſe by Conſent* is call'd when any Part of the Body that is affected with a Diſtemper, does communicate either the ſame, or one of another Nature, to another Part.

The Reaſon of this *Conſent* muſt, according to *Etmuller*, be look'd for in the Connexion of the nervous Parts, which are either *continuous*, and for that Reaſon, when we are ready to vomit, the Under-Lip is ſeized with a Trembling, becauſe the Stomach, *Oeſophagus*, the Mouth, and Lips, are inveſted with the ſame Membrane; or elſe they are *contiguous*; whence it is, that thoſe who are affected with the Strangury, have at the ſame Time frequent Inclinations to go to Stool: Or elſe they are conjoin'd only by the Twigs of the Nerves; whence it is, that the Gravel or Stone of the Kidneys is attended with Pains in the Belly, Vomiting, and a *Dyſuria*, becauſe the Meſentery, from whence the Kidneys receive their Nerves, ſends forth its nervous Branches to all theſe Parts: For the Nerves of the Kidneys, which are adjacent to the *Omentum*, being forced by the exceſſive Pain into convulſive Contractions, all the other Nerves which have any Communication with them, do alſo undergo the ſame convulſive Motions.

This Conſent or Sympathy cannot be attributed to any other, but to the nervous Parts only, conſidering that theſe are like Strings and Membranes, imbibed with the Animal Spirits, extended and diſperſed into all the other Parts of the Body.

Now if you pinch or ſtrike at one of the Extremities of theſe Strings or Membranes, the whole Chain and Contexture will receive the ſame Motion, and will run through, and be communicated to the whole Subſtance of the Nerves and Membranes, as well thoſe that are *contiguous*, as to thoſe that are *continuous*; ſuppoſing that this Tenſion is made and upheld as well by the Continuation of the Tenſion, as by the moſt rapid Motion of the Animal Spirits.

Thus we ſee when the Membrane of the Brain is prick'd or wounded, the whole Body is ſeized with Epileptick Convulſions; and in Caſe the interior Membrane of the Noſe be irritated, the Breaſt ſtarts upwards.

The Reaſon of theſe *Phænomena* cannot be look'd for any where elſe, but in the Connexion of the Nerves of the Membrane of the Noſe with the Intercoſtal Nerves.

Theſe are the *true Sympathy* and *Conſent* of the Parts. If ſo it happens, that by the Circulation of the Blood, the vitious Excrements of one Part are tranſplanted into another, ſo as that the Diſeaſe ſeizes upon this Part, this cannot be called a Diſeaſe by Conſent, but only a Tranſplantation of the morbifick Matter, becauſe the latter of theſe Parts is not affected but after the other, by what they call a *Deuteropathy*, and not by *Sympathy*.

There are divers other Affections which are ſaid to owe their Origine to the Conſent of the Parts, though it is certain that they proceed rather from the Alteration of the whole Maſs of Blood, or from Imagination, or from the Agitation of the Animal Spirits which enſues, or elſe from ſome other Cauſe.

Of this Kind is the pretended *Conſent* betwixt the Teſticles and the Lungs, and the *Trachæa Arteria*, becauſe ſometimes a Cough which has ſeized the Lungs turns into a Swelling of the Teſticles; and at the Age of Puberty the Virility of the Teſticles introduces ſuch an Alteration in the *Trachæa Arteria*, as makes the Perſon ſpeak

ſpeak or ſing with a ſtronger and more grave Sound or Voice. An *Epithema* of the great *Joborb*, or Houſe-Leek, mix'd with Vinegar and Vitriol, and applied to the Teſticles, will in a ſhort time diſſipate the Vapours of ſtrong Liquor that aſcend into the Head when a Man is drunk. The ſame *Epithema* applied to the Region of the Liver, will ſtop the Bleeding at the Noſe; and when we walk bare-footed upon a cold Marble Floor, we are ſeized with the Cholick and Looſeneſs, and ſometimes alſo with the Head-Ach.

Who is ſo ignorant as not to know what Sympathy there is betwixt the Womb and the Breaſts, and that theſe grow flaccid when the Firſt is ſwell'd?

Hiſterick Women are ſubject to feel an exceſſive Cold on the hind Part of the Head, which by the Practicians is attributed to the Indiſpoſition of the Womb, becauſe ſo ſoon as this is corrected, the Cold ceaſes.

Hereditary Diſeaſes are call'd thoſe that are tranſplanted from Parents to their Children, as the Gravel, the Gout, Conſumptions, Nephritick Pains, and Melancholy, which, as they are of a long Continuance, ſo they are for the moſt Part incurable; and their Cauſe is no leſs hidden than the Manner of their Generation.

Van Helmont aſſerts, That the Chronical Diſtempers which are communicated from the Parents to their Children, as for Inſtance, the *Gout*, do not cauſe Pain any other Way than by ſtrongly affecting the Spirits. This Affection produces a certain Ideal Character, which remaining engraven in the Spirits, and being intermix'd with the natural *Idea's* in the Act of Generation, are the Cauſes of that hereditary Diſeaſe that enſues.

Thus that Diſeaſe which is tranſplanted from the Parents to their Children, is imprinted into the Seminal *Archæus* of the *Semen* of the Parents, in order to make its Appearance in its proper Time; for it is as it were dormant, and not awaken'd unleſs it be by ſome occaſional Cauſe, when it revives, and exerts its former *Idea's*.

Etmuller is of Opinion, That the hereditary Diſeaſes have their Foundation in the Spirit of the Father, that flows into the Parts, which has undergone an Alteration by the implanted Spirit of ſome certain Part, afflicted for a long Time with ſome Diſeaſe, and which is very much degenerated from its true Temperament.

This Spirit which flows into the Parts being communicated to the *Fœtus* in its Generation, and implanted into certain Parts in its Formation, and encreaſing ſucceſſively by little and little, as well as its Alteration *contra Naturam*, which it had received before, the ſame is exalted gradually, till it is enabled to produce the ſame Diſeaſe in the Son, wherewith the Parent was poſſeſſed before him.

A *malignant Diſeaſe* is call'd that which does not appear to be ſuch by its Signs and external Appearance, though in Effect it be of a malignant Nature, venemous, and mortal, as we ſee it happen in a malignant Fever, which is not attended with any other Signs of its Fatality, but by a ſudden Violence of its Symptoms, a ſudden Loſs of Strength without any manifeſt Cauſe; as likewiſe the Camp-Fevers, which are remarkable only by Three dreadful Symptoms, *viz.* an exceſſive Pain in the Stomach, with Inquietudes, an inſupportable Pain in the Head, and a *Delirium*, and a moſt violent Swelling of the Tongue.

The *malignant Fevers* are the moſt common among all the other malignant Diſeaſes, though their Nature is not diſcovered as yet; ſome attributing their Cauſe to a peculiar Corruption or Coagulation of the Blood, as *Willis*; others to a Diſſolution of the Blood, cauſed by a very acrious volatile Salt, as *Sylvius*; others again to a very venemous Putrefaction, as *Langius* and *Hartman*: But I know not any one Author hitherto, who has given us an exact Explanation of its Eſſence, nor of the Manner of Acting, becauſe theſe have not been diſcovered as yet, as I told you before.

Etmuller tells us in general, That the Spirits are affected in a particular Manner in the malignant Fevers: Sometimes the vital Spirits, together with the Maſs of Blood, which occaſions the ſudden Loſs of Strength, the Rapidity and Lowneſs of the Pulſe, with an Inclination to ſweat: Sometimes again the Animal Spirits are affected, and the nervous Syſtem; the Conſequences of which are, Want of Sleep, a *Delirium*, and

Convulſions, without any Inclination to ſweat.

To be ſhort, the Cauſe of the malignant Fevers has an abſolute Tendency to the Deſtruction of the Spirits that flow into the Parts.

The Times or Degrees of the Diſeaſes challenge our particular Attention, eſpecially in all Sorts of Fevers, but more eſpecially in the Acute. Their Paroxyſms, or ſucceſſive Remiſſions, do depend on the ſeveral Degrees of the Fermentation of the Blood, which alſo produces the other Symptoms, and the Signs of Concoction, in thoſe Diſeaſes that are likely to prove ſalutiferous, and of the Crudity of the Humours in thoſe Diſeaſes that prove mortal.

The *Concoction* is nothing elſe but the Separation of the morbifick excrementitious Parts or Humours, cauſed by the Fermentation of the Blood; juſt as the Lees are ſeparated from the Wine by Fermentation. Part of theſe Excrements, after their Separation and Precipitation, being abſorbed by the aqueous Humour, and carried off by Urine, appears at the Bottom of the Urinal like a Sediment, which is a Sign that the Concoction is made.

Beſides this, the Times or Periods of the Diſeaſes are the Rules of a methodical Practice. And this Aphoriſm of *Hippocrates*, *Cocta non cruda medicari oportet, &c.* muſt be underſtood not only of Purgatives, but alſo of all manifeſt Evacuations by Urine or Sweat: For as Nature does not make its Evacuations but when the Diſeaſe is *in Statu*, (as they call it) when the Concoction is accompliſhed, ſo a Phyſician ought to imitate Nature, and in the Beginning and Encreaſe of the Diſeaſe preſcribe only *Præcipitantia*, and reſerve his Sudorificks and other Evacuations till the Diſeaſe is *in Statu*.

The *Symptoms* muſt be number'd amongſt the Things *contra Naturam*. By the Symptoms we underſtand certain Accidents, which are the Conſequences of the Conſtitution of the Part which is affected with a Diſeaſe, as the Shadow follows the Body; and conſequently they do depend on the Diſeaſe, either mediately or immediately.

There are three ſeveral Sorts of Symptoms: The *Firſt* are, the Symptoms of the Actions being impaired, which are either quite abo-liſhed, or only diminiſhed; either increaſed, or elſe depraved. The *Second* are the Symptoms of the Excrements: And the *Third*, the Symptoms of the Qualities, which have undergone an Alteration, according to their natural Courſe or Order; for the Excrements cannot be vitiated, nor the Qualities be changed, without a previous vitious Diſpoſition of the Actions, and more eſpecially the Digeſtion and Diſtribution.

There are many *different* Sorts of the *morbifick Cauſes*, according to *Etmuller*.

Firſt, In *Reſpect of its Connexion with the Effect*, the morbifick Cauſe is diſtinguiſh'd into an immediate, or near, or into a mediate, or remote Cauſe.

Secondly, In *Reſpect to its Conſiſtency with the Body of the Patient*, the Cauſe is either External or Internal, and either of them in Regard to the ſtrict Connexion there is betwixt the Cauſes and the Effect.

Thirdly, The *Cauſe of a Diſeaſe is either* caſual or accidental, or elſe neceſſary and natural.

Fourthly, The *neceſſary Cauſes* are either the natural or unnatural Things, or elſe thoſe *contra Naturam*: Theſe laſt are chiefly the vitious Humours.

Fifthly, The *next or immediate Cauſe* is diſtinguiſh'd into the *efficient formal*, or elſe into the *efficient material* Cauſe: The Firſt is nothing elſe but the Spirit, which is the Author of the Motion and Actions, as well in the State of Health, as of Sickneſs. The efficient material Cauſe is ſome vitious Matter, which irritating the Spirit, forces it upon an irregular Action. This is call'd the *Occaſional Cauſe* by *Van Helmont*.

Thus in the Tooth-Ach, the efficient formal Cauſe of all the Symptoms that attend it, is the Spirit put into Diſorder, which communicates the Senſe of Pain to the Part; and the efficient, material, or occaſional Cauſe is the Acid fixed in the Root of the Tooth.

Sixthly, The *efficient material Cauſe* is either conjoin'd or antecedent, or elſe *procatarick*, which make up a Compoſition of divers Cauſes, which by their Concurrence form what is call'd the *material Cauſe*.

A *Sign*, according to *Etmuller*, is a certain Thing that is known, which is able to lead us into the Knowledge of another Thing as yet

yet unknown; ſo that, according to this Definition, a Sign ought to fall under the Cogniſance of the Senſes, in order to conduct the Spirit to thoſe Things which are beyond the Reach of our Senſes, and to determine it to diſcover by Way of Reaſoning the Thing unknown by that which is known. That which enables the Spirit to diſcover an unknown Thing by another already known, is nothing elſe but the Parity or Connexion there is betwixt theſe Two laſt; ſo that if this Connexion is of a neceſſary Conſequence, the Signs will be neceſſary likewiſe: And theſe Sorts of Signs are commonly known by the Name of *Pathognomick* Signs, of which there are but few; but in caſe this Connexion is contingent, the *Signs* are alſo only *probable*.

Theſe Things that have a Connexion betwixt one another, are the Cauſes and the Effects which have a mutual Relation to each other; all Things that ariſe by a mutual Conſequence, either of themſelves, or elſe by Accident; and in ſhort, all thoſe Things that have ſome other Connexion, or mutual Relation to each other.

Upon this Foundation they have raiſed a Superſtructure of Three univerſal Signs.

The *Firſt* is of the Effects, or ſuch Things as enſue, which comprehends Three Sorts of Symptoms, unto which they refer the Pulſe, the Urine, and thoſe Things that either help, or prove noxious.

The *Second* is of thoſe Things that precede, or of the internal as well as external Cauſes, and the common as well as the proper, under which are comprehended the natural Conſtitution of the Patient, which produces in him a certain Diſpoſition to ſuch or ſuch a Diſeaſe, either naturally, by Reaſon of his Temperament, his hereditary Qualifications, his Sex, *&c.* or elſe by Accident, by Reaſon of his Age, Education, Manner of Living, *&c.*

The *Third* is of ſuch Things as are eſſentially united, *i. e.* of the Affection it ſelf againſt Nature, which ſometimes falls under the Cogniſance of our Senſes.

Among the *Diagnoſtick* and *Prognoſtick* Signs, the chief or moſt principal are thoſe taken from the Urine and the Pulſe, becauſe they immediately diſcover the preſent State of the Strength and vital Power, which has its Foundation in the Blood.

There are Two Sorts of Urines, *viz.* the thick pale Urine, and the ſanguine or red Urine.

The *Firſt* ſhews the Qualities of the Aliments, and what Alterations they have received in their Firſt *Viæ*, as alſo their Manner of Digeſtion.

The *Second* diſcovers the Conſtitution of the Blood, which depends on the Fermentation of the Particles, but more eſpecially of the *Saline*, which compoſe its fluid Part, and beſt of all diſcover the Alterations, which happen to it by Reaſon of its Purity, or cacochymical Impurity.

The Pulſe indigitates to us the State of the vital Fermentation of the Blood in the Heart, and that of its Diſtribution into all the other Parts.

To be ſhort, the Urine diſcovers to us the State of the Firſt and Second Digeſtion, both which are accompliſhed by Way of Fermentation; as the Pulſe does ſhew the State of this renew'd fermentative Motion of the Blood, as well as of its circular Motion, which depends on the Firſt.

The Judgment that is founded upon and taken from the Inſpection of the Urine, is often very fallacious and uncertain, eſpecially in malignant Fevers: And the ſame may with very good Reaſon be ſaid of the Pulſe, which often deceives us alſo, by Reaſon it is ſubject to divers Alterations, on Account of ſeveral Paſſions, and becauſe there are certain Perſons, in which the Pulſe beats naturally irregular at all Times.

Thus the Pulſe in Women when they are affected with a Fever oftentimes does deceive the Phyſicians; and ſometimes it happens, that we meet with a laudable Pulſe in the right Arm or Wriſt, when it beats very ill in the left: Of which *Bartholin* has given us a remarkable Obſervation, this Difference being occaſioned by an Ulcer or Abſceſs in the Lungs of the ſame Side.

Two Conjectures may be drawn from the Pulſe, upon which you may found a rational Prognoſtick.

The *Firſt* is, the State of the vital Fermentation of the Blood in the Heart. The *Second* is, the Quality or Circumſtances of the

Strength, whether great or ſmall, according to the Fermentation of the Spirits of the Blood.

A weak, ſmall, and frequent Pulſe, join'd together, is very bad, unleſs it happens in exceſſive Pains. The Incontinency and Interruption of the Pulſe is alſo very dangerous, unleſs it be in theſe Three Caſes, *viz.* in Malignant Fevers, in the Pleuriſy, and in the Confirmed Hypochondriack Diſtemper, or in the Scurvy; for thoſe that are well verſed in the Practice of Phyſick are very ſenſible that the Pulſe varies very much in theſe Diſtempers; That it is ſometimes intermitting, without Danger of preſent Death; and that it will revive and return again, and beat very ſtrong, and will be attended with a Palpitation of the Heart.

Sometimes the Strength or Malignity of the Diſeaſe is ſuch, as to ſurpaſs all the Skill of a Phyſician; and therefore a learned and underſtanding Practiſer ought by a judicious Conjecture to have a good Inſight, and give his Judgment accordingly in good Time, whether the Diſeaſe be curable or not; and if it be, by what Remedies.

To be ſhort, he ought to foreſee the Event of the Diſeaſe, and the Time as well as the Manner of this Event. But after all, I would not adviſe him to be too forward in ſentencing his Patient to Death without Reprieve, becauſe it is next to an Impoſſibility to know exactly every Thing that has a Regard to the Patient, by reaſon of the great Difference that is obſervable in the Temperament of divers Perſons: Whence it is, that we ſee ſometimes almoſt miraculous Events happen in theſe Caſes; for what is more frequent than to ſee ſome Patients who have been given over for loſt, to recover, contrary to the Judgment and all the Hopes of the Phyſicians.

The Foundation of a regular Prognoſtick does conſiſt in a mature and circumſpect Conſideration of the true Strength of Nature, and the Violence of the Diſeaſe: Theſe being well weigh'd and counterballanced one with another, you may from thence form your Conjecture, and judge which of the Two is likely to have the better of it, and by what Remedies it is to be accompliſhed.

Such a Prognoſtick as this may very well be compared to a Tryal at Law, where the Patient is the Defendant, and the Diſeaſe the Plaintiff, and the Signs are in lieu of the Evidences, eſpecially thoſe taken from the Conſequences.

The natural Actions or Functions are Evidences for the Patient or Defendant, and the Symptoms for the Diſeaſe or the Plaintiff: Nature is the Advocate, and the Phyſician the Judge, who gives Sentence againſt One of the Two, or elſe ſuſpends his Judgment, if the Caſe be doubtful, and allows of an Appeal to a higher Court.

The Trial is at its Height at the Time of the *Criſis*, which is followed by a ſudden Alteration either for the better or for the worſe.

But theſe *Criſes* are very rare in the cold Climates, where our Bodies are ſolid, their Nouriſhment is groſs, and they are often ſubject to the Scurvy; the Conſequence of all which is, that the Blood is not ſo apt to go into an Effervescency as in the hot Countries, and therefore not ſo well adapted for theſe ſudden and critical Alterations.

'Tis upon this Account that we have no great Regard to the *Criſes* here, and that not without very good Reaſon, becauſe an able Phyſician ought to endeavour to be beforehand with them; the more, becauſe the critical Days are uncertain, and becauſe there happen many ſalutiferous Days beſides the Seventh.

A Phyſician that puts his chief Confidence in the *Criſis*, and expects its Coming, lays the whole Burthen upon Nature, while he acts the Part of an idle Spectator, and not of a Phyſician; whereas he ought to be the Servant and Aſſiſtant of Nature.

This may be effected by promoting the Concoction by the Means of *Præcipitantia* and gentle Evacuations of the concocted Matter, by gentle Diaphoreticks, and other ſuch-like Remedies.

Ferdinand ſays, That the *Criſes* of the Chronick Diſeaſes commonly make their Appearance betwixt the Thirtieth and the Fortieth Days.

The Climacterick Year, which comes every Seventh Year, has ſomething in it reſembling to a *Criſis*, and therefore may very well be called the *Grand Criſis*.

Some General OBSERVATIONS *concerning* CHIRURGICAL OPERATIONS. *Taken from Monſieur* Dionis's *Courſe of* Chirurgical Operations, *demonſtrated in the Royal Garden at* Paris.

BY the Words of *Chirurgical Operations* muſt be underſtood a prudent and methodical Application of the Hand to the humane Body, for the Preſervation and Recovery of its Health.

All the Chirurgical Operations are reduced under Four Kinds: The *Firſt* of theſe reunites what was ſeparated, and is call'd *Syntheſis*. The *Second* divides or ſeparates thoſe Parts, the Union of which is contrary to our Health: This is call'd a *Diereſis*. The *Third*, which is known by the Name of *Exereſis*, takes off what is foreign. And the *Fourth*, which is call'd *Protheſis*, does add what is wanting.

The *Syntheſis* is an Operation which rejoins and reunites with Dexterity thoſe Parts of our Body that are ſeparated or diſplaced, contrary to the common Courſe of Nature. It is diſtinguiſh'd into Two Sorts, to wit, the *common*, and the *particular*. The *Firſt* belongs to all the Operations where there is any Occaſion for Compreſſes or Bandages, Inſtruments, or the Application of any Thing that may reſtore the affected Part to its true Poſition.

The *Second* is applied as well to the ſoft as to the hard Parts. When it is made upon the ſoft Parts, it is made either where there is no Diviſion, and then it is called *Taxis*, or elſe where there is a Diviſion, and then it is call'd a *Suture*. That which is made upon hard Bodies is diſtinguiſh'd alſo into Two Sorts, to wit, that which is applied to broken Bones, and that which is made upon diſlocated Bones.

The *Syntheſis* challenges the Preference before all the other Operations; for, beſides that it is moſt neceſſary, it makes Uſe of the moſt ſimple Means to reſtore to the humane Body that entire Frame of its Parts which the Author of Nature has been pleaſed to beſtow upon it.

The *Diereſis* is an Operation which divides and ſeparates thoſe Parts, the Union and Continuity of which is an Obſtacle to the Cure, or which are conjoin'd and united together contrary to the Courſe of Nature. This Operation is performed Four different Ways, to wit, by Inciſion, by Pricking, by Tearing, and by Burning. Theſe Four Sorts of Operations are applied both to the ſoft and to the hard Parts: For the Particulars whereof we muſt refer you to the Courſe of the following Operations.

The *Exereſis* is an Operation which cuts off or pulls out of the Body ſuch Things as are ſuperfluous, hurtful, or foreign to it. This Operation is performed Two different Ways, to wit, either by *Extraction*, as when we are forced to draw or pull out ſome Things as are naturally progenerated in the Body, but are become foreign to it, as a dead Child, or in the Detention of Urine: Or elſe by *Extraction*, when we take out of the Body ſuch Things as are againſt its Nature, and are conveyed to it from Abroad: This is done either without making a Wound, or by making One; as for Inſtance, when this foreign Matter is lodged within ſuch Cavities as have a large Opening or Iſſue, as the Cavities of the Noſe, of the Ears, *&c.* If you will anſwer the true End of an *Exereſis*, you muſt firſt of all examine the Condition of the Party from whom this Matter is to be drawn out: Secondly, by the Nature of that foreign Matter that is to be taken away: And Thirdly, by what Inſtruments it is to be performed.

The *Protheſis* is the Fourth Sort among the Chirurgical Operations, by which we add to the Body ſome Inſtrument or other which

which may ſupply the Defect of the Part that is wanting. Theſe Defects are either *natural*, as when ſome Part is wanting in a Child from the Time of its Firſt Formation; or *accidental*, as for Inſtance, when a Man loſes an Eye, an Arm, or Leg, by ſome external Accident. In ſuch Caſes we muſt have Recourſe to ſome Inſtrument, that may repair that Part which we have been deprived of by Miſchance.

Four different Uſes ariſe from the *Prothesis*: The *Firſt* relates to the Neceſſity of an Action, as when we add a wooden Leg, for the Conveniency of Walking. The *Second* is to reſtore to ſome Part its Action, or elſe to facilitate it; as when, for Inſtance, we put a Plate of Silver or Lead into the interior Part of the Mouth, when the Palate is eaten away; without which they muſt ſpeak through the Noſe, and cannot ſwallow without much Difficulty. The Third is for Ornament's Sake, as when we put an artificial Eye into the Orbit. And the *Fourth* is for to repair the ill Conformation of ſome Part. Thus crooked People wear Iron Stays whilſt they are young.

The Authors do not very well agree concerning the Order that is to be obſerved in the Demonſtrations of theſe Four Sorts of Operations; for ſome take them in this Order as they are mentioned here, to wit, Firſt, the *Syntheſis*; next the *Dieresis*; after this the *Exereſis*; and laſtly the *Protheſis*; whereas others begin their Chirurgical Demonſtrations at the Head, next thoſe of the Breaſt, then thoſe of the Belly, and do finiſh with thoſe of the Extremities or Limbs: But others following the Footſteps of moſt of the Anatomiſts, begin with the lower Region, or the Belly, aſcend from thence to the Breaſt, then to the Head, and leave the Extremities or Limbs till the laſt.

Among all theſe Operations, ſome are gentle, and oftentimes very eaſie, at the Operation of letting of Blood; and others again are very dangerous, and not to be done without much Difficulty, as the Opening of a *Bubo*; and others there are which are never to be performed without a great deal of Pain and Dread, as the Amputation of an Arm and of a Leg.

Other Operations there are which are abſolutely neceſſary for the Preſervation of Life, as the Operation with the Trepan, and in the *Empyeuma*; and others again are made only for the Conveniency of Life, as when we endeavour to ſtop up a *Fiſtula Lacrymalis*, or to couch a Cataract: And other Operations there are that have been deſcribed by the ancient Authors, but are rejected by the moderns, becauſe they were either too cruel, or elſe altogether uſeleſs; ſuch are the large Inciſions in the Head, the Cauterizations of the Liver, Spleen, and Joints.

The modern Chirurgeons do not only differ from the ancients in the Number, but much more in the Manner of performing many of thoſe Operations they have deſcribed in their Books: For it is to be obſerv'd, That Chirurgery has acquired much more Politeneſs and Light of late Years, than could be expected in former Ages, when the Animal Oeconomy was not near ſo well underſtood as now it is. The Searing-Irons and Inſtruments have been baniſhed from this Art; ſo that now we cure our Patients by much more gentle and ſecure Methods than they did with all their moſt dreadful Inſtruments in former Times.

If you will make your Operations as you ought to do, you muſt perform it with Dexterity, and a good Aſſurance of Succeſs, with the Conſent of the Patient on one Side, and with Dexterity and Security on the Part of the Chirurgeon; for a true-bred Chirurgeon ought to diſtinguiſh himſelf from pretending Quacks, not only by his Dexterity, *i. e.* by his Exactneſs and Induſtry in the Chirurgical Operations, and to act with Security in ſuch a Manner, as to apply all the proper Remedies both to perfect the Cure, and to prevent a Relapſe; but alſo not to cajole his Patient with greater Promiſes than he is able to perform. To anſwer this Intention, he ought to have a conſtant Regard to Six or Seven Circumſtances, which are expreſſed commonly in this *Latin* Verſe:

Quis, quid, ubi, quibus Auxiliis, cur, quomodo, quando.

That is, who it is, what it is, where, by what Means, why, how, and when.

Who it is. This has a Relation to the Patient, whether he be weak or ſtrong. *Wha*

it is, relates to the Nature of the Wound, whether it be made by a Granado, whether it be a Bullet or a Piece of Iron, or a Splinter that is to be taken out. *Where*, muſt be underſtood of the Place of the Body where the Operation is to be performed, or of the Place where the Patient is to be lodged, either in a Bed or in a Chair. *By what Means*, has a Reference to the Inſtruments, Engines, and Medicines, that are proper for the Operation, and the Accompliſhment of the Cure. *Why*, indigitates the End or Aim we have to make Uſe of the moſt proper Means for the intended Cure. *How*, means in what Manner we muſt perform the Chirurgical Operation and Cure: This muſt be taught by the Art of Chirurgery. *When*, has a Relation to the Opportunity or Time, which is diſtinguiſhed into the *Time of Neceſſity*, and the *Time of Election*. The *Time of Neceſſity* is that which admits of no Delay, as when we are to ſtop a violent Bleeding; but the *Time of Election* affords us to chooſe a convenient Day or Seaſon, when there is no preſſing Neceſſity, as in *Lythotomy*.

Beſides this, a Chirurgeon ought to have due Regard alſo to Four Things: *Firſt*, to himſelf; *Secondly*, to the Patient; *Thirdly*, to his Aſſiſtants; and *Fourthly*, to the External Things.

The Chirurgeon himſelf ought to have three Qualifications, to wit, a good natural *Genius*, or Diſpoſition; a well-cultivated *Underſtanding*; and a good *Exerciſe*, or Practice. The natural Genius comprehends the Gifts of the Body, good Morals, and a natural Diſpoſition towards the Profeſſion of Chirurgery. As to his Reaſon or Underſtanding, he muſt be of a docile Apprehenſion, and of a Capacity to be inſtructed in Science of ſo vaſt an Extent. As to his Exerciſe, it muſt be acquir'd by long Experience and Practice. A Chirurgeon ought alſo to be *Ambodexter*, *i. e.* that he be able to make Uſe of both his Hands alike; there being ſeveral Operations which muſt of Neceſſity be made with the left Hand. But above all a Chirurgeon ought to give a true Judgment of his own Ability, *i. e.* if he finds himſelf either to want Strength or Experience to undertake a difficult Operation, to let it be done by another, that is better qualified for it.

Three Qualifications or Diſpoſitions are required alſo in the Patient, to wit, a good Confidence, Patience, and Obedience; for at the ſame Time that a Patient makes Choice of a Chirurgeon, he muſt look upon him as the ableſt Man which will produce the good Effect; that he will not be apt to give heed to every pretended imaginary Remedy or Secret that may perhaps be propoſed to him. *Patience* will be the immediate Conſequence of this *Confidence*; for it is abſolutely neceſſary for the Patient to ſubmit to whatever the Chirurgeon judges neceſſary to be done, in Hopes of accelerating this Cure: And if the Operation is attended with much Pain, he muſt conſider that it is unavoidable, and that they are the Effects of the Efforts that are made for his Recovery; nothing being more dangerous for a Patient than to ſpend his Strength and Spirits by Impatience and tormenting himſelf in Vain.

Obedience is another Product of a good *Confidence*; for it is abſolutely neceſſary the Patient ſhould blindly follow the Dictates or Orders preſcribed by the Chirurgeon, and to be convinced, that they are the moſt proper and ſecure Means to recover his Health.

The *Aſſiſtants* ought to have likewiſe Three Qualifications, to wit, to be wiſe, faithful, and diſcreet; for if they are *imprudent*, they will be apt to allow to the Patient ſuch Things as will prove prejudicial to him, to gratify his Deſires; though on the other Hand, I would have them not be ſo rude or ill-temper'd as to deny him what may be given to him without any Prejudice. If they are not *faithful*, they are not fit to be entruſted with ſuch Directions as muſt be given them for the Benefit of the Patient; and inſtead of following theſe Orders, they will act perhaps contrary to them, to the great Detriment of the Patient. Secrecy being highly neceſſary in many Reſpects, if they want Diſcretion, they will reveal to the Patient thoſe Things which may endanger his Life, as it has been found by frequent Experience: Beſides that, they ought to keep ſecret certain Imperfections, which they either diſcover, or are declared to them, in Relation to the Patient.

Under

Under the *External Things* are comprehended the Houſe or Chamber in which the Patient is to be lodged, for the Accompliſhment of the Cure. This muſt be in a good Air, remote from Noiſe, and provided with all that is requiſite for the Conveniency of the Patient and his Cure. His Diet both in Eating and Drinking muſt be accommodated to the Condition of the Patient, ſo as to have ſome Regard always to his Appetite. Too frequent Viſits are to be avoided. He ought to be kept in a conſtant good Humour, and all Splenetick Thoughts to be baniſhed as pernicious. The Inſtruments alſo and Medicines prepared for his Cure to be kept out of his Sight, (as much as may be) with a great Number of other Circumſtances, too many to be inſerted here.

From all theſe general Precepts we muſt draw certain Inſtructions, which may lead us into the right Way to perform each particular Operation, and which may be comprehended under the following Three Heads, to wit,

What is to be obſerved before the Operation; what during the Operation; and laſtly, what is to be done after the Operation is over.

Before you enter upon any Thing elſe that relates to the Operation, you muſt agree about the Conſequence and Poſſibility of that Operation, which depends on the Conſtitution, Functions, and Coherency of the affected Part; on the Strength of the Patient; on the Circumſtances of Time, Place, *&c.* The Operation being reſolved upon, due Preparation muſt be made of every Thing that is requiſite to put it in Execution.

Some Chirurgeons have a Cuſtom to ſend all their Implements by their Servants to the Patient's Chamber, to get every Thing in Readineſs againſt their Coming to perform the Operation, the Sight whereof puts the Patient into a worſe Dread and Agony than the intended Operation it ſelf. I would adviſe Chirurgeons not to appear in the Room till that very Moment they are to begin the Operation, and that every Thing is ready prepared to their Hands; but at the ſame Time to have every Thing made ready for them either at their own Houſes, or elſe in an adjacent Chamber to that of the Patient.

The main Thing to be obſerved during the main Operation is what is commonly call'd the *Modus Faciendi*, or the Manner of performing the Action or Operation. This does conſiſt in putting actually into Practice, according to the Circumſtances of the Caſe, all thoſe Rules which belong to the Art of Chirurgery, in ſuch-like Caſes, ſo as to endeavour to perform their Duty and Buſineſs with all poſſible Gentleneſs, Dexterity, Exactneſs, and Politeneſs.

I would have my Chirurgeon to be affable to the Patient, to encourage and comfort him, to compaſſionate his Pains, and to promiſe him not to occaſion any more Pain than is abſolutely neceſſary. A Chirurgeon ought to have a natural Dexterity in his Operations, which muſt be confirmed by a long Practice in his Profeſſion. 'Tis this that will enable him to put his Object in a due Poſition, to chooſe the moſt proper Inſtruments, and to invent even new ones in ſome peculiar Caſes, and to make Uſe of them to the Comfort of the Patient, and the Satisfaction of the Spectators.

Though the Operation be performed with all poſſible Dexterity and Application, the Chirurgeon has not acquitted himſelf altogether of his Duty, unleſs he takes Care alſo to obviate thoſe Diſorders that have been occaſioned by this Operation: The chiefeſt among theſe is the Loſs of Blood, the Flux of which he muſt ſtop immediately by ſuch Means and Ways as are preſcribed to him according to the Rules of his Art, and of which we ſhall treat hereafter in particular in each particular Obſervation. This done he muſt probe the Wound, and put a Tent into it either dry, or dipp'd in ſome proper Medicines, according to the Nature of the Wound, and afterwards apply a Plaiſter, Compreſs, and a convenient Bandage. This done, the Chirurgeon muſt take effectual Care, to the beſt of his Judgment, to put the affected Part into a due Poſition, and to be ſure to pitch upon ſuch a one as may prove the leaſt painful to the Patient, and leaſt oppreſſive to the affected Part, and ſuch as may be moſt proper to give Vent or accelerate the Iſſue of the purulent Matter.

Before

Before he departs, 'tis requiſite he ſhould leave his Directions with the Nurſe, and other Aſſiſtants, what they are to do, to keep the Patient quiet and at Reſt, and to recommend to the Patient a Tranquility of Mind, and give him Hopes of a ſpeedy and perfect Cure.

If there are more Chirurgeons than one preſent, it ought to be left to the Patient to pitch upon ſuch a one among them as he likes beſt; and if the Chirurgeon who has attended the Patient before, and to whom it belongs of Right to perform the Operation, thinks himſelf obliged to make an Offer of it firſt to another, who either by his Age or Rank has a fair Pretence to it before him, this ought to be done without the Knowledge or Preſence of the Patient, who ought not to be diſturbed with ſuch-like Ceremonies in the Midſt of his Miſery, but to be left to his own free Choice.

There is another uſeleſs if not pernicious Ceremony I cannot approve of, to wit, for all the Chirurgeons that are preſent to probe or put their Fingers into the Wound, which is in Effect to cauſe as many freſh Pains to the poor Patient, and to prolong his Miſery. 'Tis ſufficient, and it belongs to the Chirurgeon that is to perform the Operation, to examine and look into what is to be done; and I would not have him admit of above one of the other Chirurgeons that are preſent, at the moſt.

Some Chirurgeons there are, who, after having put their Patients into a moſt mortal Fear, by asking them a Thouſand impertinent and dreadful Queſtions, and appearing before them with their Hair tied behind, their Arms naked, and with the Knife in their Hands, like ſo many Butchers, are after all this not aſhamed to be out of Humour, and to grumble at the Patient when he breaks out into Lamentations and Outcries during the Operation; but this ſavours of Inhumanity and Cruelty: He ought rather to ſhew ſome Signs of Compaſſion for his Sufferings, and exhort him in a gentle Manner to Patience.

'Tis my Opinion alſo, That Two other Perſons, but ſuch as are neceſſary, ſhould be preſent during the Operation; for a great Number of uſeleſs Spectators upon ſuch-like Occaſions do moſt commonly prove troubleſom both to the Patient and the Chirurgeon.

When a Chirurgical Operation is over, the Firſt Thing the Patient, as well as his Friends, ask the Chirurgeon, is, What he thinks of the Matter? Here the Chirurgeon ought to act with all imaginable Prudence and Precaution, and to be ſure not to tell any Thing to the Patient that may vex him, and hinder the Cure: But at the ſame Time not to diſguiſe the Truth from his Friends and Relations; nothing being more prejudicial to the Cure than to frighten the Patient almoſt into his Grave by ill-grounded Fears.

I know ſome Chirurgeons look upon this as a ſingular Piece of Policy; for ſay they, if the Patient dies, his Friends will ſay, 'tis nothing but what the Chirurgeon did foretel; but if he is cured, then they cry, 'tis this Man that has ſaved his Life.

Others there are who take a quite oppoſite Courſe, and are ſure to promiſe an infallible Cure; for ſay they, People are more inclinable to put themſelves into the Hands of one who is ſure to cure them, than into the Hands of ſuch as bring them the dreadful Tidings of Death.

In my Opinion, a Chirurgon ought to avoid both theſe Extreams; for the World is grown too cunning to be impoſed upon by ſuch-like Pretenſions, there being few now-a-days but what judge both of the Sincerity and Ability of the Chirurgeon, any otherways than by the Event of the Cures he undertakes. 'Tis therefore the beſt Way to keep a *Medium* betwixt Hopes and Fear, but ſo as to incline more towards Hopes than Fear, becauſe the Firſt oftentimes produces very happy Effects, whereas the other is moſt commonly attended with troubleſom and dangerous Conſequences.

I told you before, That before a Chirurgeon pretends to undertake a Chirurgical Operation, he ought to have all his Implements in Readineſs. By theſe I underſtand every Thing without which the Operation cannot be taken in Hand, and may be reduced to Six principal Things, to wit, the Inſtruments, the Tents, the Drawings of Linen or the Lint, the Plaiſters, the Compreſſes, and Bandages. I ſay, Six principal and

general Things; for there are an almoſt infinite Number of other Things and Engines, which being adapted only to particular Operations, 'tis not for my Purpoſe to treat of them at this Time, my preſent Diſcourſe being confined only to what relates to the Chirurgical Operations in general.

Neither would I have you be ſurprized to find me to begin firſt of all here with the Inſtruments, and to reſerve the Bandages for the laſt Place, becauſe in this Point I do follow the Method and Order, according to which the Chirurgeons do make Uſe of theſe Means in their Operations.

Concerning CHIRURGICAL OPERATIONS *upon the BONES. Taken out of* Hieronymus Fabricius ab Aquapendente *his Treatiſe of* Chirurgical Operations.

The PREFACE, *treating of* CHIRURGICAL OPERATIONS *in General.*

WE now proceed to the Chirurgical Operations, call'd by the *Greeks Chirurgia, i. e. Manual Operation*, becauſe they are performed and accompliſhed by the Help of the Hands.

Theſe Operations are either external, *i. e.* ſuch as are made in the external Parts of the Body; or elſe internal in ſome Reſpects, *viz.* ſuch as are made in thoſe internal Parts which are not out of the Reach of the Chirurgeon's Hand.

The Intention and End of theſe Operations is, the reſtoring to Health the affected Parts, as far as the Cure thereof depends chiefly and only on the Chirurgical Operation; ſo that when a Chirurgeon does apply certain Medicaments to a Tumour, Wound, or Ulcer, this is not properly ſpeaking a Cure performed by his manual Operation, becauſe it is owing to the Remedy; but in caſe the Chirurgeon opens an Abſceſs by Inciſion, or reduces a diſlocated Joint, 'tis beyond all Diſpute, that the affected Part is reſtored to Health by the manual Operation of the Chirurgeon.

We intend to treat, eſpecially in the following Treatiſe, as well of thoſe Operations which depend abſolutely and ſolely on the Chirurgeon's Hand, as well as of thoſe that are performed both by his Hand and the Chirurgical Inſtruments.

In theſe Operations there are Four Things that fall chiefly under our Conſideration, to wit, the Diſeaſe, the affected Part, the Manner of Adminiſtring the Chirurgical Operations, and laſtly, the Inſtruments by the Means whereof they are accompliſhed. But before we enter upon a particular Enquiry of all theſe Heads, there are ſeveral Things worthy our taking Notice of.

And firſt of all, as to what relates to the preternatural Diſpoſition, or the Diſeaſe of the affected Part, its Signs, Cauſes, Prognoſticks, we intend ſometimes to make particular Mention of them, but at other Times paſs them by in Silence, *viz.* when they are eaſily known or diſcovered.

But what is moſt requiſite of all, is, that we muſt not only form to our ſelves an *Idea* of the Nature and Symptoms of the Diſtemper, but alſo have before our Eyes the Delineations of the Chirurgical Inſtrument: And as to what relates to the affected Part, you will meet in this Treatiſe with a particular Account of the Diſeaſes that peculiarly belong to each Part, which are common to many, and where they have their proper Seats, and conſequently will be convinced,

vinced, that the ſimilar as well as the diſſimilar Parts are the Objects of Chirurgical Operations.

When we come to treat of the Manner of adminiſtring the Chirurgical Operations, you will be convinced alſo of Two Things, to wit, the different Methods uſed by the Ancients in theſe Operations, as well as thoſe practiſed by the Moderns, beſides ſeveral others, which have either been invented, or elſe altered by my ſelf; for it will be obvious to every Body that will take the Pains to read this Treatiſe, That there is a remarkable Difference betwixt the Chirurgical Operations of the former Ages and thoſe of ours; as likewiſe, that ſome of theſe Operations of the Ancients are quite out of Date now-a-days, whereas others are ſtill retained as uſeful among us.

Beſides this, ſome of the Chirurgical Operations are mild, ſmall, and of an eaſie Performance, others are very hard and dangerous, and others again moſt violent and painful, others again there are which are abſolutely neceſſary for the Preſervation of Life, others contributing only to the Conveniency of it.

Thoſe that are mild and eaſie, or reputed as ſuch, are generally made Uſe of; but among thoſe which are difficult or hard to be put in Execution, ſome are put in Practice, but others rejected. Thus the Inciſion and Uſtion of the Veins of the Temples and of the *Occiput*, as alſo the *Vena Poplitæa*, as alſo the Application of ſome of the Remedies of the Ancients within the Eye with ſome others of this Kind, are now not put in Practice. In the ſame Manner are rejected alſo the great and dangerous Operations; as for Inſtance, that wherein they uſed to make an Inciſion in the Skin of the Head from one Ear to the other, in the Affections of the Eyelids, becauſe the large Extent of the Wound may prove dangerous; for, according to *Celſus*, there is no great Wound but what is dangerous: And as to thoſe that are exceeding violent and painful, theſe are never put in Practice, excepting in Caſes of imminent Danger; for then it is much better to run the Riſque of Life, than to loſe it without attempting its Preſervation. Thus in caſe the Glans of the Manly Yard is not covered as it ought to be, we ſeldom proceed to the Circumciſion of the Prepuce, becauſe it is not requiſite for the Preſervation of Life; whereas on the contrary, in the Caſe of an imperforated *Anus*, we, by the unanimous Conſent of all underſtanding Phyſicians, attempt its Perforation, becauſe Life lies immediately at Stake.

The laſt Thing intended to be treated of in this Treatiſe are the Chirurgical Inſtruments, by the Help of which the Chirurgical Operations are accompliſhed. Here will in the firſt Place be ſhewn the Names as well as the ſeveral Kinds of theſe Inſtruments, both thoſe uſed by the Ancients and by the Moderns, as alſo ſome which are of our own Invention; all which together amount to a very conſiderable Number: For as I have practiſed this Part of Phyſick for near theſe Fifty Years laſt paſt, it is eaſie to be imagined, that I have loſt no Opportunity of providing a very handſome and compleat Magazine or Store of all the choiceſt Chirurgical Inſtruments, whereof I intend now to give a full View to the young Students in this Profeſſion.

In ſo doing I ſhall take effectual Care to give a Deſcription of the Inſtruments that are particularly adapted to the Operations to be made in each Part, though, as I told you before, they will amount to a great Number, becauſe I thought fit, for your better Inſtruction, to give you an Account as well of the good as of the bad, and of the more and leſs uſeful Inſtruments of Chirurgery; for thoſe invented by the Ancients are for the moſt Part not ſo commodious and uſeful as thoſe uſed by the Moderns. The *Archetypus*, an Inſtrument deſigned for the taking out of the *Polypus*, is of a new Invention: Beſides that, in many Places they are neither provided, or if they were, the Chirurgeons do not underſtand how to make Uſe of the nicer Sorts of Inſtruments, but content themſelves with indifferent ones: Whereas in other Places they will not make Uſe but of the choiceſt Sort, as our Chirurgeons do here at *Padua*; from whence the young Students in Chirurgery will draw this Benefit, that they may know how to reject the bad Ones, and make Choice only of ſuch as are of the beſt Sort.

In giving you an Account of all theſe Operations, I will begin with thoſe of the Head, and ſo take my Courſe through every Part of the Body to the very Feet, in the ſame Order and Method as they are ſet down here.

To the Head belong Twelve Chirurgical Operations: [1.] How to make a *Fontanella*, or Iſſue in the *Sutura Coronalis*. [2.] How to raiſe or lift up the Bones that have ſuffered a Depreſſion. [3.] How to make a Perforation in the Skull with the Trepan. [4.] How to ſcrape it with the Rugine. [5.] How to levigate or ſmooth the Edges of the Hole in the perforated Bone by the Lenticular Inſtrument. [6.] How to manage or cure the carious Bones of the Head. [7.] How to cut out a Piece of a Bone betwixt Two Holes by the Help of the Siſſars. [8.] How to preſs down the *Dura Mater* with the Inſtrument call'd the *Decuſſorium*. [9.] How to ſaw the Bone with a ſmall Saw. [10.] How to take out the Shivers or ſmall Pieces of a Bone. [11.] How to make an Inciſion or Section in the *Sinciput*, to prevent Defluxions upon the Eyes. [12.] In what Manner the Inciſion is to be made in the *Hydrocephalus*.

To the *Occiput* belong Three: [1.] The Venæſection behind the Ears. [2.] The making of a *Setum* there. [3.] The Aduſtion in young Infants and Children.

To the Eyelids appertain Nine of theſe Operations, *viz.* [1.] How to cure the *Ancyloblepharon*. [2.] The Warts of the Eyelids. [3.] The Bladders. [4.] The Barley-Corn. [5.] The *Chalazion*. [6.] The exceſſive Hairs growing on the Eyelids. [7.] The Relaxation of the Eyelids. [8.] The *Lagophthalmon*. [9.] The *Ectropion*.

To the Eyes belong Eight: [1.] How to cure a Suffuſion, or the Cataract. [2.] A new and eaſie Method of our own Invention to apply Remedies to the Eyes. [3.] How to cure the *Staphyloma*. [4.] The *Unguis* of the Eyes. [5.] The *Encanthis*. [6.] The *Hypopyi* of the Eye. [7.] The *Fiſtula Lacrymalis*. [8.] How to ſubſtitute a falſe Eye inſtead of another that is pull'd out.

To the Noſe do belong Three Chirurgical Operations: [1.] How to draw out the *Polypus*. [2.] How to cure the *Ozæna*. [3.] Concerning the Smoking of Tobacco.

To the Lips Four: [1.] How to cure the Fiſſures in the Lips. [2.] How to make an Addition to the Lips when too ſhort. [3.] How to produce an Agglutination of the Lips when they are ſlit too deep. [4.] How to remove the *Carcinoma* of the Lips.

Two to the Gums: [1.] How to conſume the relaxed, tumefied, and putrid Gums. [2.] How to reſtore the corroded Gums.

There are Seven Operations belonging to the Teeth: [1] How the Teeth, when they are fix'd too cloſe together, may be parted. [2.] How to remove the *Oſtracodermata* of the Teeth. [3.] How to cure rotten Teeth. [4.] How to preſerve them by putting Gold upon them. [5.] How to remove thoſe Teeth that are incommodious and not in their right Place. [6.] How to make ſmooth and even ſuch Teeth as do prick the Tongue and the Cheeks. [7.] How to draw uſeleſs Teeth.

To the Palate Two: [1.] How to ſtop up and make good a Hole occaſion'd by an Ulcer in the Palate. [2.] How to apply a Cautery to the Bone when found carious.

To the Tongue Four: [1.] How to keep or preſs down the Tongue, in order to diſcover any Indiſpoſition in the Mouth. [2.] How to cleanſe the Tongue from ſuch viſcid and thick Excrements as will oftentimes adhere very cloſe to it. [3.] How to cut the Bridle or Ligament wherewith the Tongue is tied underneath. [4.] How to make an Inciſion in the *Batrachion*, or the *Ranula*.

One to the *Uvula*, *viz.* how to cure it when it is relaxed, or gone into a Corruption.

One to the Tonſils or Almonds of the Ears, *viz.* How an Inciſion muſt be made there when they are come into a Suppuration.

One to the *Fauces*, or Throat, *viz.* how a Fiſh-Bone, or any other ſharp Thing of that Nature, which ſticks in the Throat, is to be taken out.

Two to the Mouth: [1.] How a Patient is to be fed, in which the Parts belonging to the Mouth are dried up. [2.] How a Patient is to be fed, who is not in a Condition to raiſe up his Head.

One

One to the Chin, *viz.* how to take out a Part of the Jaw-Bone, which is become rotten either by an Abſceſs or by the Drawing of a Tooth.

To the Ears there belong Four ſeveral Chirurgical Operations: [1.] How to make good that Part of the Ear which is wanting or too ſhort. [2.] How to open it when it is obſtructed either by a Caruncle or by a Membrane. [3.] How to take out any external Thing that is fallen or conveyed into the Ear. [4.] How it is to be perforated for the carrying of ſome ornamental Things in them, out of *Celſus*.

To the Neck likewiſe Four: [1.] How to cure the *Bronchocele*. [2.] How the ſtrumous Ulcers or Swellings. [3.] How to reduce the Neck to its natural Poſition, when it is diſtorted by Defluxions of a Humour. [4.] How the *Aſpera Arteria* is to be perforated in the *Angina*.

Three to the *Thorax*: [1.] How to make a Perforation in the *Thorax* in the *Empyeuma*. [2.] How to cure a *Fiſtula* in the *Thorax*. [3.] How to cure its Gibboſity.

Four to the Breaſts: [1.] How to draw out the Nipples when they lie hidden within the Breaſts. [2.] How to diſpel the congeled Milk. [3.] How to cut out the Cancer of the Breaſts. [4.] How to check the exceſſive Growth or Protuberancy of the Breaſts in Men.

Nine of theſe Operations appertain to the *Abdomen*: [1.] How to cure the cold Intemperature of the Stomach by a Cautery. [2.] How to open an Abſceſs of the Liver by a Cautery. [3.] How to apply a Cautery in the *Scirrhus* of the Spleen. [4.] How to correct the Protuberancy of the Navel. [5.] How to cure the diſrupted *Peritonæum*, when the Skin remains entire, by a Chirurgical Operation. [6.] How to tap out the Water of the *Abdomen* in hydropical Perſons. [7.] How to manage the Wounds and the Sutures of the Wounds of the *Abdomen*. [8.] How to cure the *Varices* of the lower Belly. [9.] How to manage the Abſceſſes and *Fiſtula's* of the *Abdomen*.

Two to the Bladder: [1.] How to open the Paſſage for the Urine when ſtop'd by the Stone. [2.] How to cut and take out the Stone out of the Bladder.

Ten to the manly Yard: [1.] How to cover the Glans of the Yard when it is not covered by the Prepuce. [2.] How to clear it from it when it is quite covered. [3.] How to draw or convey Rings through the Yards of young People. [4.] How to adminiſter Circumciſion on the Prepuce. [5.] How to draw out a Stone that is fixed in the Urinary Paſſage. [6.] How to prevent the Heat of Urine in the *Gonorrhæa*. [7.] How to remove the *Caruncula*, or cure an Ulcer in the Urinary Paſſage. [8.] How to ſeparate the Prepuce when it is grown to the *Glans* of the Yard. [9.] How to make an Aperture in the *Glans* that is imperforated. [10.] How to cure the Excreſcencies on the *Glans* of the manly Yard.

One to the Groins, *viz.* how to open a *Bubo* without any Danger to the Veſſels.

Six belong to the Teſticles: [1.] How to cure the inteſtinal Ruptures, either with or without taking out of the Teſticles. [2.] How to cure the *Epiplocele*. [3.] The *Hernia Aquoſa*, or aqueous Rupture. [4.] The *Sarcocele*. [5.] The *Hernia Carnoſa, eademque Aquoſa*. [6.] The *Ramex*.

Eight of the Chirurgical Operations belong to the natural Parts of Women: [1.] The Chirurgical Operation adminiſtred to *Hermaphrodites*. [2.] How to be aſſiſtant to Women that are incapable of carnal Copulation, by Reaſon of certain Indiſpoſitions in their genital Parts. [3.] How to make a Perforation in the *Hymen* that is imperforated. [4.] How to ſeparate or open the Lips of the *Vulva* when grown or clos'd up together. [5.] How to cure Excreſcencies or Abſceſſes within the *Sinus* of the *Vulva*. [6.] How to reſtore the Womb to its natural Situation, when it is fallen down. [7.] How to extract a dead *Fœtus*. [8.] How to extract the After-Burthen when left behind.

Seven belong to the *Anus*: [1.] How to make a Perforation when the *Anus* is imperforated. [2.] How to cure the *Procidentia* of the *Anus*. [3.] How the *Condylomata*. [4.] How the Excreſcencies. [5.] How the Ulcer of the *Anus*. [6.] The *Fiſtula in Ano*. [7.] The *Hæmorrhoides*, or Piles.

After

After theſe come in their due Courſe the Chirurgical Operations appertaining to the Limbs, or the Arms and Legs; ſome whereof are proper and peculiar to them, and ſome belong to them in common with the other Parts of the Body.

There are no leſs than Twelve Chirurgical Operations appertaining properly to the Arms and Legs: [1.] How to make Iſſues in them. [2.] How to proceed in the Amputation of theſe Members, when infected by a Gangrene, or by a *Sphacelus*. [3.] How the Fingers that are grown together may be parted aſunder, or ſeparated. [4.] How a Finger, when incurvated either by an Ulcer or by a Scar, is to be diſtended and made ſtreight again. [5.] How a Joint that is left rigid is to be meliorated. [6.] The *Vari*, how to be cured. [7.] How the *Valgi*. [8.] The Nails, how to be managed. [9.] How to cure the *Pterygion*, or *Paneritium* of the Nails. [10.] How to take out the Nail of the Great Toe, when turn'd and grown inwards into the Fleſh. [11.] How to take out the *Varices*. And, [12.] How to apply the Cautery to the Joints.

But as the Arms and Legs conſiſt of Fleſh and Bones, as well as the other Parts of the Body, they require alſo various Chirurgical Operations, according as either of theſe Parts are affected with ſome Diſeaſe.

In reſpect to the fleſhy Part, they require Three different Sorts of Chirurgical Operations, becauſe the Fleſh ſuffers under Three Kinds of Diſeaſes, *viz.* a Tumour, a Wound, and an Ulcer.

When there is a Tumour, it requires an Inciſion, and a Cleanſing of the Abſceſs, and ſometimes that the *Folliculus* or *Ceſtus*, in which the Matter of the Abſceſs is contained, be taken out.

In Wounds there is required Deligation, a Suture, the *Fibula*, agglutinative Applications; as alſo how Arrows, Bullets, may be extracted out of the Wound, and thoſe made by Gun-ſhot may be cured.

The Ulcers require Cauterizations by the Help of the Searing-Iron, eſpecially if theſe Ulcers are malignant, putrid, gangrenous, and fiſtulous.

In Reſpect to the Bones, there are various Chirurgical Operations required in theſe Parts; for the Bones are much ſubject to a Solution of Continuity, which if it be owing to an internal Cauſe, there ariſes a *Caries*, or Rottenneſs; but if from an external Cauſe, it is call'd a Fracture, which is accompanied with a Wound, and ſometimes is without it. The Bones are ſubject alſo to Luxations in their Joints.

The Firſt Chirurgical Operation here is made in the Fractures without a Wound, as alſo in thoſe with a Wound, and is accompliſhed by the Means of Deligation, Bandages, *Ferulæ*, Caſes, *&c.* The Second is made when there is an ill Coaptation of the fractured Bone. The Third in Luxations or Diſlocations of the Joints. The Fourth in the Cure of the *Gummata*, or Nodes. And the Fifth and laſt, in the *Caries* or Rottenneſs of the Bones.

From all which it is evident, That Chirurgery is the moſt comprehenſive and moſt noble, as well as the moſt uſeful Part of Phyſick, which *Hippocrates*, *Galen*, *Celſus*, and many other amongſt the moſt celebrated ancient Phyſicians, have not been aſhamed to practice and make Uſe of in their own manual Operations. And as by the Chirurgical Operations ſuch Cures are accompliſhed, as are beyond the Reach of Medicaments, ſo it is the more valuable upon that Account, as alſo for its Certainty. *Celſus* has not without great Reaſon given this Judgment of Chirurgery, that Fortune or Chance has a conſiderable Share in the Effects of Medicaments; but that in Chirurgery it depends altogether on the Operation, and that conſequently its Effects are obvious to our Senſes.

A ſmall TRACT *of* WOUNDS *in General. Taken out of Monſieur* St. Hilaire's *Anatomy of the Humane Body, and its Diſeaſes, from the Third Edition printed at* Paris, 1698.

A Wound is a freſh Diviſion or Solution of the Continuity, being bloody, and made in the ſoft and fleſhy Part by ſome external Cauſe.

The Wounds are either *ſimple* or *complicated*. *Simple* Wounds are thoſe which have nothing elſe but a bare Diviſion of the Fleſh, without being attended by any other Symptoms. On the contrary, the *complicated* Wounds are never without ſome Symptoms, as Inflammation, Contuſion, Loſs of the Subſtance, *&c.*

The Cauſes of the Wound are always external, being ſuch Things as are capable to ſeparate the Parts; and this is done either by pricking, cutting, ſtriking, or hurting. The Wounds given by venemous or enraged Creatures are of the Firſt Kind, or elſe come by Bitings. The Wounds made by Bullets or Fire-Arms belong to the ordinary Cauſes of Wounds, attended with Contuſions.

The Signs belonging to external Wounds are manifeſt, becauſe the Diviſion of the Fleſh is viſible; but the internal Wounds are not ſo ſoon diſcovered: Of which we ſhall ſay more in their proper Places.

As to the Prognoſtick Part, it is a general Queſtion, Whether a Wound be mortal or not? which muſt not be confounded with another Queſtion, Whether it be curable or incurable? For there are abundance of Wounds that are not curable, or cannot be healed for a conſiderable Time, which for that Reaſon are not mortal. Thus if a Perſon that is affected with the *French* Pox receives a Wound, it will prove very difficult to be cured; and may be ſaid to be incurable, becauſe it will often degenerate into a malignant and ſtubborn Ulcer, but nevertheleſs it will not, as we ſaid before, prove mortal.

We call that a mortal Wound which of Neceſſity is attended with Death. This may happen either becauſe the Blood iſſues or ſtreams forth in ſo great a Quantity, that it is paſt all Remedy to ſtop it; or elſe becauſe one of the noble *Viſcera*, which is neceſſary to the Preſervation of Life, has received a conſiderable Wound. 'Tis alſo to be obſerved, not only how much the Part is wounded, but alſo what Sympathy it has to another: As for Inſtance, if we find a ſlight Wound to be attended with Convulſions, you may conclude that a Nerve is wounded, and that it will prove mortal. To ſpeak in general, a Wound may be judged to be mortal, when the Motion and Diſtribution of the Animal Spirits is interrupted or ſtop'd; for whenever this happens, the *Animal* cannot live, but muſt die.

A Wound that has cut the *Iliack* Branch in the Leg aſunder is mortal, becauſe the Flux of Blood which enſues, is not to be ſtop'd. 'Tis for the ſame Reaſon that the deep Wounds of the Liver are mortal, becauſe the great Veſſels that are encloſed in it will ſend forth ſuch a Flux of Blood, as is not to be ſtench'd.

The Wounds of the Heart are not always mortal, if they are not very large, and penetrate into the Ventricles, but eſpecially into the Left Ventricle. The ſuperficial Wounds of the Heart, which touch only the muſcular *Parenchyma*, are not mortal, though ſometimes Death follows upon them, by Reaſon of the large Veſſels of the Lungs, which have been impaired by the Inſtrument in its Paſſage to the Heart.

The Wounds of the Inteſtines, Stomach, and of the Bladder, do ſcarce ever admit of a Conſolidation, by Reaſon of their nervous Contexture, which renders them very dangerous, and Death often enſues.

The Wounds of the Tendinous Part of the *Diaphragma* will not reunite, unleſs they are very ſmall, and conſequently they become

come mortal, becauſe they hinder Reſpiration, and are very ſubject to Inflammations.

The Wounds of the Brain are different. Thoſe that wound only the cortical Subſtance, without any conſiderable Contuſion, are leſs dangerous, provided they are rightly managed; but thoſe that penetrate very deep into the Medullary Subſtance are moſt commonly mortal.

All the Wounds that are attended with a great Inflammation, a continual Fever, Convulſions, and other pernicious Symptoms, are very dangerous. Thoſe of the Nerves and Tendons are likewiſe not without Danger, by Reaſon of the Convulſions: A certain Seroſity iſſues from them, which is nothing elſe but an extravaſated *Lympha*. If a Nerve or Tendon is cut quite aſunder, there is much leſs Danger than if they are only a little wounded.

The Pricking of a Nerve or Tendon is attended with very dangerous Symptoms, which are not to be ſeen if they are cut quite through: (1.) For when a Nerve is only prick'd, the Courſe of the Animal Spirits is not interrupted in the Muſcle, into which the Nerve is diſperſed. On the contrary, they flow thither in a much greater Quantity, by Reaſon of the Irritation which is occaſion'd by the extravaſated Juices in the other Fibres of the ſame nervous String. (2.) Becauſe when a Nerve is prick'd, 'tis the exterior Membrane of the Nerve (which is of a moſt exquiſite Senſe) rather that is prick'd, than the medullary Part of the Nerve. (3.) When the Membrane of the Nerve is diſturbed, the Integuments of the Brain, of the *Cerebellum*, and the Spinal Marrow, muſt of Neceſſity ſuffer likewiſe by Conſent, which conſequently muſt cauſe a Convulſion. (4.) As the particular Convulſion in one peculiar Part owes its Origine to the Pricking or Irritating of a Nerve of that Part, being vellicated by an acrious Humour; ſo the univerſal Convulſion of the whole Body cannot be produced by any Thing elſe, than by the acrious Humours or Salts, which corrode the Membranes of the Brain, of the *Cerebellum*, and of the Spinal Marrow. Of this we ſee every Day moſt fatal Conſequences in Burning Fevers, and in ſome other Diſeaſes, wherein the Blood is over-ſtock'd with Acids; for the Blood being carried up to the Head with a very rapid Motion, the acrious Vapours that are ſeparated from it, do moſt violently vellicate the membranous Parts contained within the Head, and produce moſt dreadful Convulſions.

From what has been ſaid, it is eaſie to conceive, why the ſimple Pricking of a Nerve is ſubject to more Danger than when it is cut quite aſunder; for when it is quite ſeparated, its Extremities draw backwards, and the adjacent Fleſh which covers it defends it againſt the Action or Force of the Acids and of the Air: For the Air is very noxious to the Wounds of the Nerves and Tendons, becauſe it contains, among others, many acrious Particles, which ariſe from the terreſtrious Bodies, and fill up the Atmoſphere.

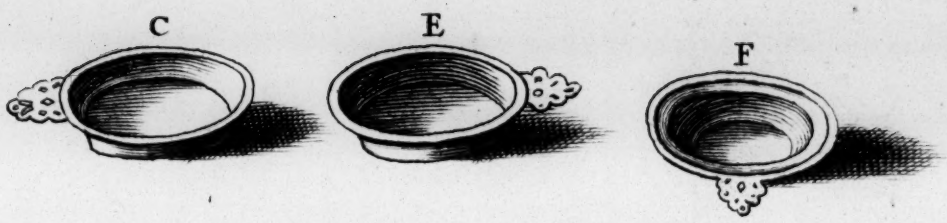
When we ſee the purulent Matter in a Wound brought to a Concoction, as they call it, it is a good Sign, and ſhews, that the Wound is in a fair Way of Conſolidation. In the Heat of the Summer even the ſlighteſt Wounds are not altogether without Danger, by Reaſon of certain Symptoms that are apt to ſupervene in that Seaſon, as the Gangrene, *&c.* For during the exceſſive Heat of the Summer Seaſon, the Blood is not ſo ſpirituous as in the Winter, becauſe a conſiderable Quantity of it is diſſipated by Tranſpiration.

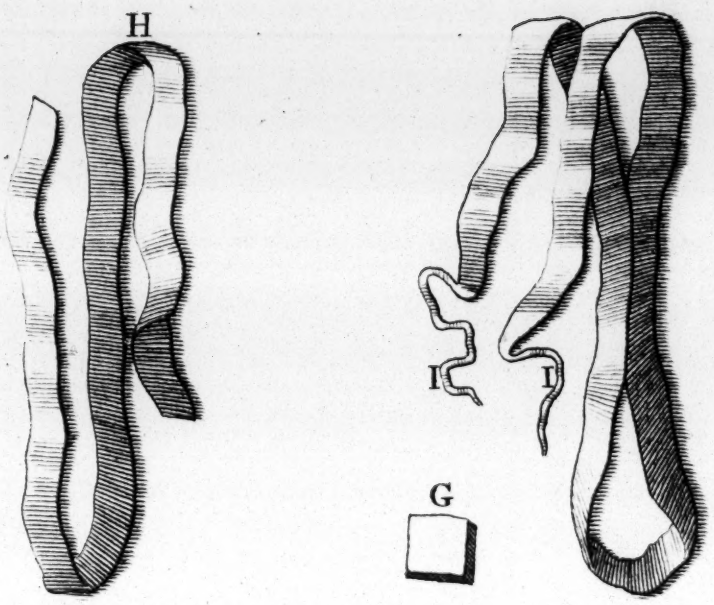
The exceſſive cold Seaſon is no leſs obnoxious to the Wounds than the violent Heat, becauſe the Cold coagulates the nutritious Juices, and checks the inſenſible Tranſpiration, which often cauſes Inflammations, Gangrenes, *&c.*

The ancient Authors tell us, That it is a very bad Sign when we meet with a large Wound without a Tumour; but according to the Moderns, it is much better if it be without a Tumour, than to be too much tumefied; for, ſay they, when there is no Tumour, 'tis a Sign that the Juices are not ſtop'd in their Courſe, and that on the contrary, when the Wound is attended with a great Tumour, that the *Tubuli*, or ſmall Pipes of the Part are compreſs'd, and that the Juices have not their due Courſe.

Wounds that have been expoſed for a long Time to the Air, do moſt commonly gangrene, which is owing to the acid Particles of

N.o I.





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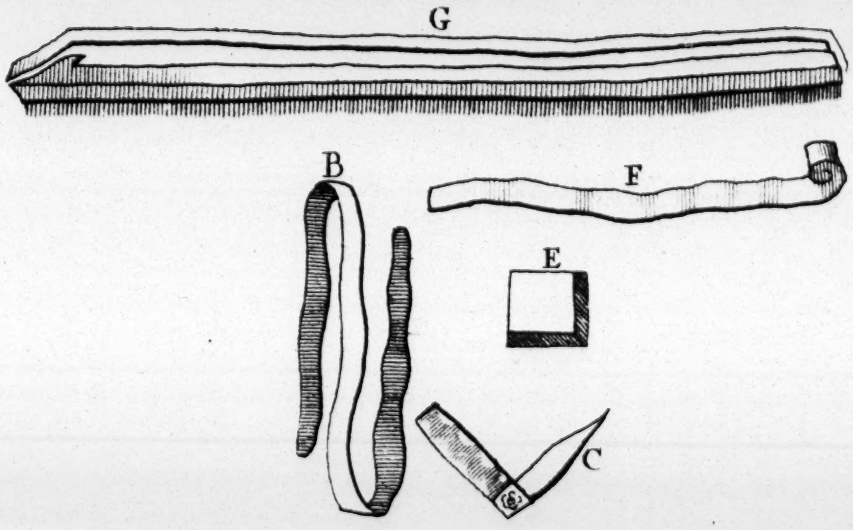
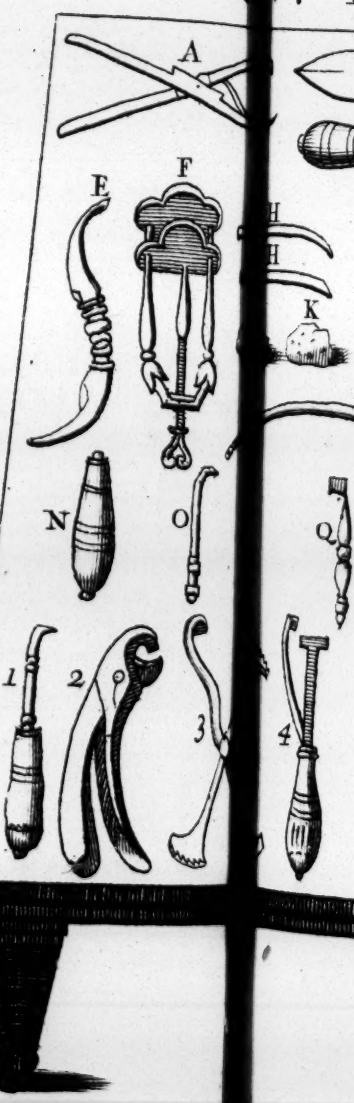
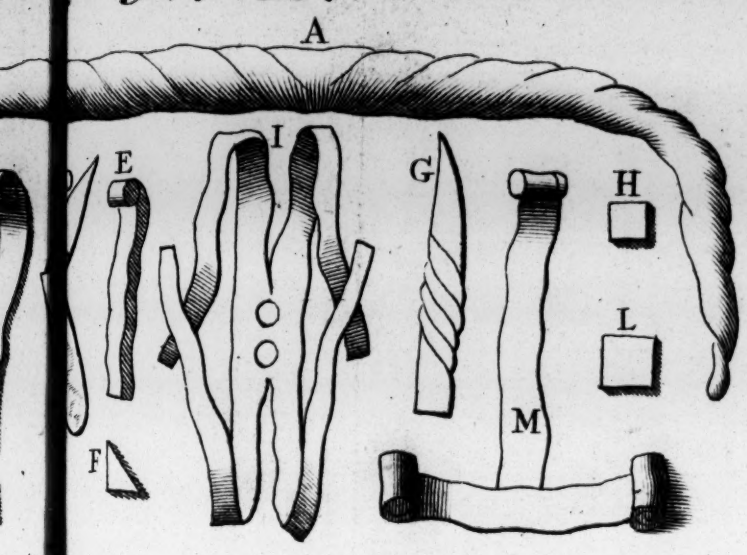




The Instruments, Bandages &c. taken out of Mons.r Dionis his ca[se] of C[hirurgery]

N.o III.



N.o V.

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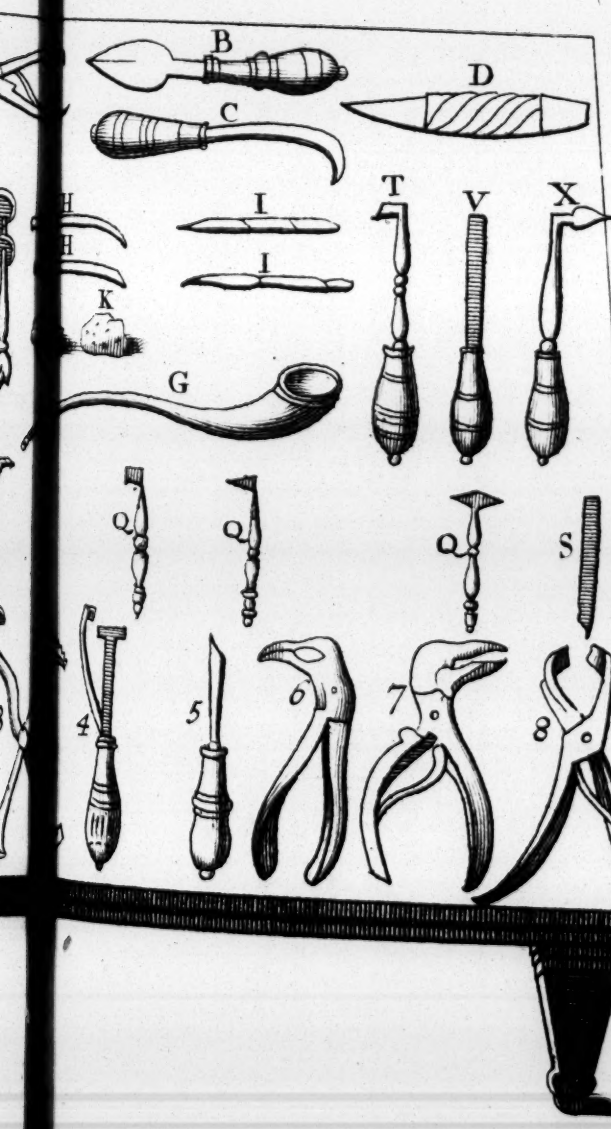

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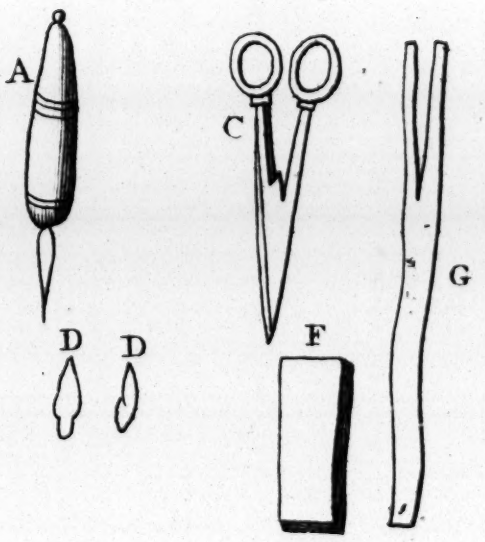

...e of Chirurgery relating to Venæsection, the teeth, &c.

of the Air. Wounds made by Fire-Arms are much more dangerous than any other Wounds, by Reaſon of the great Contuſions the Bullet makes in its Paſſage athwart the Parts.

Poiſon'd Wounds, and thoſe made by the Bitings of venemous Creatures, are exceeding dangerous; and if you do not provide proper Antidotes, they prove mortal. 'Tis much more difficult to reunite a round Wound than thoſe where the Lips touch together.

The Wounds that penetrate into the Head, into the Breaſt, and Belly, are much more dangerous than Fleſh-Wounds. The Wounds occaſion'd by the Stinging of Waſps and other Inſects are dangerous, becauſe they may be followed by Inflammations, Convulſions, a Gangrene, and ſometimes Death enſues, eſpecially if the Wound be given by a Scorpion.

If we conſider, that the Inſects which wound us with their Sting do emit a corroſive Liquor like an *Aquafortis*, and that this Sting is as hard as a Horn, 'tis manifeſt, that whenever ſuch an Animal does wound a Man, its Sting muſt of Neceſſity penetrate very deep into the Nerves, Tendons, or membranous Parts. This Sting is hollow like a ſmall Syringe, through which the Inſect ſpurts out the Liquor when he gives the Wound.

The TABLE relating to PHLEBOTOMY, the Operations for the TEETH and the NAILS, *&c.*

N° I. *repreſents the Inſtruments, Bandages,* &c. *belonging to the Operation of Phlebotomy in the Arm.*

A. The Lancet-Caſe.
B. A Lancet open'd with an obtuſe Angle.
C, E, F. Three ſmall Porringers.
G. A ſmall Compreſs.
H. The Band or Roller.
I, I. The Two Extremities of the ſaid Roller.

N° II. *repreſents the Inſtruments, Bandages,* &c. *belonging to Venæſection in the Foot.*

B. The Ligature.
C. The Lancet.
E. A pretty thick Compreſs.
F. The Band or Roller.
G. The Bandage.

N° III. *repreſents the Inſtruments, Bandages,* &c. *belonging to the Operations of Phlebotomy, and of Arteriotomy on the Head.*

A. A Handkerchief twiſted together.
B. A Band.
C. A Compreſs.
E. A Band.
F. A Compreſs.
H. A ſmall Compreſs.
I. A Band or Roller.
G. The Lancet.
L. The Compreſs.
M. The Band or Roller.

N° IV. *gives you a Delineation of the ſeveral Inſtruments belonging to the Operations for the Gums and the Teeth.*

A. The Pincers.
B. The Scalpel.
C. The Inſtrument call'd the *Crooked.*
D. The Lancet.

E. The Elevatory.
F. Another Inſtrument with a Screw, for the Opening of the Teeth
G. The Horn wherewith to convey Food through a broken Tooth into the Mouth.
H, H. Tooth-picks.
I, I. Quills for the ſame Uſe.
K, K. Little Spunges for the Cleanſing of the Teeth.
N. The Screw whereon to ſcrew the ſeveral Inſtruments made Uſe of for the Teeth.
O. An Inſtrument call'd the *Dechauſſoir.*
Q, Q, Q. Certain Rugines for the Teeth.
S. Files for the Teeth.
T. Another Rugine.
V. A File.
X. An actual Cautery.
(1.) A *Dentiſcalpium.*
(2.) A *Denticulum*, or *Denticeps.*
(3.) A *Polycampus*, or *Pelican.*
(4.) A Kind of an Elevatory.
(5.) An *Impulſorium.*
(6.) A *Roſegra*, or Root-Drawer.
(7.) A *Tenaille*, or Nippers, call'd the Reven's-Beak.
(8.) A Pair of Inciſive *Tenailles.*

N° V. *repreſents the Inſtruments belonging to the* Panaritium, *or Abſceſs under the Nails of the Fingers*

G. The Lancet.
H. A Pledget.
M. A Thumb or Finger-Caſe, with its Strings.

N° VI. *repreſents what is neceſſary towards the Cure of the vitious Excreſcency of the Nail of the Great Toe.*

A. An Inciſion-Knife call'd the *Biſtoury.*
C. The Siſſars.
D, D. The Bourdenets or Doſſils.
F. A Compreſs.
G. A ſmall Band or Fillet.

Some General DIRECTIONS *for* Bandages, Tents, Pledgets, Doſſils, *and ſome other Things relating to Dreſſing of* WOUNDS. *Taken out of Monſieur* Le Clerk, *Phyſician in Ordinary to the* French *King, his Treatiſe of Bandages and Dreſſings, by Way of Abſtract from the* French *Original.*

THE Bandages being very numerous, this Author has taken peculiar Care to reduce them to a very moderate Number.

As for Inſtance, the Bandages belonging to the Head he reduces to Two only, *viz.* the *folded Handkerchief* and the Sling with Four Ends or Tails. Thoſe of the *Thorax* to the Napkin only; and thoſe of the Limbs to ſeveral Convolutions of a *Roller*, which are called *Rounds* or *Turnings*, and *Edgings.* He calls Fillets and Rollers certain Pieces of Linen Cloth, very narrow in Reſpect to their Length; and a circular Bandage, when a Part is ſo roll'd that the *Rounds* or *Turns* above do exactly cover thoſe beneath.

But a *Bandage* with *Edgings* is made by the Help of a Roller, carried up and down obliquely, ſo as that the firſt Rounds are not covered by the next.

A creeping Bandage he calls that where a Roller is brought round a Part in ſuch a Manner,

Manner, as that the Convolutions of it do leave a Space betwixt one another, without touching each other at all.

Rollers, ſays he, muſt be made of ſtrong Cloth, yet ſo as not to be new, for it will be too ſtiff, and that without any Liſts; for theſe being not apt to give Way, or ſtretch, as the middle Part of the Roller will do, this will grow ſlack, and ſo make the Ends of a fractur'd Bone to part from each other.

He ſays, that when a Part is to be roll'd, you muſt end with a Round or Two about it, and to be ſure not to forget to turn back the End of the Roller, for fear the Roller ſhould elſe break through the Threads.

That in all Fractures and Diſlocations the Roller muſt be ſtreight, yet ſo as not to intercept the Circulation of the Blood, for fear of a Mortification or Gangrene.

He calls a Roller with one Head when it is rolled up at one End only; and with Two Heads, when it is rolled up at both Ends.

He adviſes in general, That you ſhall unfold your Roller as little as can be, becauſe it will elſe be troubleſome; but that when you are to apply a Roller with Two Ends, and are to bring one over the other, in order to make Circumvolutions on the Part; you may then undo a great Part of it, that ſo one of the Ends may paſs over the other the ſmoother: That in the Rolling of a certain Part of an unequal Bulk, ſuch as a Leg, in order to avoid making of a Purſe as it were whereabouts the Calf is, you are to lay a Finger on that Part of the Roller where you intend to bring it back, and ſo make a Pleat every Round, whilſt the Part is leſſening; or elſe you may apply to the ſaid Part gradually Compreſſes under the Roller.

That you muſt take Care to faſten your Roller well at the Beginning, by making Two Rounds about the Part; and if it be a Bandage with Two Heads, then to begin with the Middle of it, ſo that the Two Ends be on the upper Side of the Roller.

In the Rolling of a fractured Part, you ſhall always keep it ſteady with one Hand, whilſt you carry the Roller round with the other, and ſo alternatively as you have Occaſion to ſhift the Head out of one Hand into the other.

That before you take off any Dreſſings, you muſt always cleanſe the Wounds with the Edge of the *Spatula*, which elſe would produce ſmall Ulcers under the Incruſtations; and if you ſhould defer it till afterwards, too much Air will enter into the Wound: For which Reaſon it is alſo, that you ſhall not take off one Dreſſing before the other is ready at Hand.

An Emplaſter, ſays he, is not to be applied a Second Time no more than a Roller, when it has taken up a great deal of the purulent Matter; and when this Matter is to be taken from a Wound, it muſt not be done by wiping it, but only by preſſing it gently out with a little Lint, eſpecially when the Wound begins to incline towards Healing; but that if there be any Sinuoſities in the Wound, not to dwell too long upon the Uſe of Rags or Tents, but to ſyringe them with proper Liquids. And as to the Fractures, he adviſes you always to ſteep the Rollers and Compreſſes in ſome warm Wine, Oxycrate, *&c.* to prevent Defluxions upon the Parts.

Concerning Lint, Pledgets, Doſſils, Tents, &c. *he gives us the following Directions.*

Lint is to be made of ſuch Rags as are not too old, which are to be cut about the Largeneſs of the Palm of a Hand: Theſe muſt be drawn Thread by Thread, and the Threads to be laid by the Sides of one another.

When you are to make a Pledget of this Lint, you muſt take a Handful of it, or in Proportion to the Bigneſs of the intended Pledget, and draw it in the other Hand, by clapping your Thumb upon it. Now the Threads muſt croſs each other, to keep them the better together: Then turn the Lint quite round, to raiſe the Ends of the Threads, lay it on the Back of the Hand, and with the Palm of the other rub it till it be cloſe enough, and of ſuch a Figure as you have Occaſion for.

Doſſils are made of Lint alſo, which muſt be drawn between the Thumb and the Fore-Finger: Bend it then in the Middle, to raiſe its Ends; which done, you roll

roll it ſtrongly together between both Hands, of ſuch a Bigneſs as Occaſion requires.

Tents, ſays he, are made either of Lint, or elſe of ſmall Pieces of Linen Cloth.

The ſmaller Sort are made of Lint, almoſt in the ſame Manner as Doſſils are; with this Difference only, That they muſt be cut at the End with a Sort of Head, to prevent their falling into the ſmall Orifices of the Wound, which they are deſigned for to keep open, in order to give Time for the diſcharging of the purulent Matter.

But thoſe made of Linen Cloth are of the larger Sort, and contrived in the following Manner: The Chirurgeon takes a ſmall ſquare Piece of a Rag at one of its Corners, and rolls it betwixt the Thumb and Fore-Finger, making one of its Extremities pointed, but ſo as that it grows bigger gradually towards the other End. Over this he rolls another Piece of Cloth, and continues to do this till the Tent be according to his Mind, and big enough for the Wound: Then he blunts the pointed End a little, for fear of hurting the Bottom of the Wound: He ſlits the upper or thicker End tranſverſedly; and after all cuts it with the Siſſars lengthways, to give it a Head: And becauſe theſe Sorts of Tents are deſigned for large Wounds or Orifices, he muſt tie a Thread to them.

Whenever a Roller with one Head will ſerve the End of the Chirurgeon, he is not to make Uſe of one with Two Heads. And a Roller of a middling Breadth is the fitteſt to make a cloſe and firm Bandage.

A very narrow Roller muſt be folded at the End, and then be kept betwixt the Fore-Finger and the Thumb of the Left Hand, and the other End in the Right Hand, between the Little Finger and the *Annularis*: Then let him put the Thumb of the Right Hand on its Head, and the Fore-Finger beneath, and roll it cloſely betwixt the Two Thumbs and the Fore-Fingers.

A middling Roller muſt be kept betwixt the Fingers of the Left Hand and the *Mons Veneris*, ſo as to put the Thumb of the Right Hand on the Head, and the Fore-Finger beneath.

Large Rollers may be kept betwixt the Fingers of both Hands: And in undoing a Roller, it muſt be gathered into a Heap; without which it would be very troubleſome.

For the reſt, he adviſes his Chirurgeon in the Applying, as well as in the Drawing off of the Dreſſing, to ſhew ſomething of Tenderneſs, but nothing of Fear, leſt he ſhould be judged thereby incapable of doing his Duty, *&c.* For the further Particulars of which, we will refer the Reader to the before-named Treatiſe it ſelf, it being tranſlated into *Engliſh* ſome Time ſince.

Of the INSTRUMENTS *of* CHIRURGERY *in General. By Monſieur* Dionis.

'TIS impoſſible to practice Chirurgery without proper Inſtruments. The Ancients have left us many Deſigns of them in their Writings: But it muſt be ſaid, to the eternal Praiſe of our modern Chirurgeons, that the Inſtruments they make Uſe of are much more commodious, and not ſo groſs as thoſe of the Ancients. They have not only retrenched ſome of the ancient Inſtruments that were too groſs and uſeleſs, but have alſo much amended and perfected thoſe they have retained, and invented many new ones.

We look upon the Chirurgical Inſtrument as a Second Cauſe which is aſſiſtant or ſubſervient to ſomething, if guided by an induſtrious Hand; ſo that the Hand and the Inſtrument are Two efficient Cauſes, without which a Chirurgical Operation could not be effected; with this Difference nevertheleſs, that the Hand is the principal Cauſe, becauſe it produces and directs the Mo-

of the Inſtrument; ſo that the other is no more than a ſubordinate Cauſe.

Among theſe Inſtruments, the Chirurgeons have ſome in common with ſeveral other Artiſans, as the *Siſſars*, the *Needles*, the *Raſors*, or *Knives*; others belong to the Chirurgeons in particular, as the *Lancet*.

Among thoſe that belong properly to the Chirurgeons, ſome are call'd *General*, becauſe they are ſerviceable in ſeveral Diſtempers, and divers Parts of the Body, as is the Knife call'd the *Biſtoury* in *French*; and others which are actually *proper* or *particular*, becauſe they are adapted to and employed in certain Diſeaſes and in certain Parts only of the Body; ſuch is the *Trepan* in the Fractures of the Skull.

Reaſon and Experience muſt be your Guides in the due Application of theſe Inſtruments. The Firſt inſtructs us how to chooſe ſuch an Inſtrument as is ſuitable to our preſent Intentions; and the Second makes us dextrous and bold in the Management of it: There being nothing that is more likely to infuſe Courage into an Operator, than the Uſe of ſuch Engines as have been approved by him by frequent Experience, and good Succeſs.

Among all thoſe different Inſtruments that are or may be made Uſe of in the Chirurgical Operations, there are ſome which are neceſſary to put them in Execution, and others there are which are ſubſervient only to its better Accompliſhment. There is an almoſt infinite Number of the Firſt Kind, ſuch as ſerve to ſeparate a Continuity, to reunite what is ſeparated, to draw out what is foreign and noxious, *&c.* Theſe are ſuch as ſtand us in great Stead in many Caſes, where we could ſcarce expect any Relief from the Application of Medicines, nor from any other Remedies; as for Inſtance, by what Means is it poſſible to promote the voiding of Urine out of the Bladder, when it has loſt its Reſſort, but by a Probe; or to couch a Cataract without a Needle?

Of the Second Sort are the Beds, Benches, Cuſhions, *&c.* which ſerve to facilitate the Operation, and which are alſo almoſt numberleſs, but muſt not be neglected, becauſe they are ſubſervient to the Accompliſhment of the Work.

But it is Time we ſhould come to a particular Examination of the Chirurgical Inſtruments.

A. The *Siſſars* are the moſt common Inſtruments belonging to Chirurgery: The biggeſt of all are thoſe that ſerve for the Cutting of Bandages, Compreſſes, Plaiſters; and being deſign'd for all Manner of coarſe Buſineſs, they are conſequently ſtronger, and ſuited for ſuch Purpoſes.

B. The *Inciſion-Siſſars* are much finer, thinner, and longer. It has a ſmall Button at the Extremity of one of its Blades, being made on Purpoſe to hinder the Wound from being pricked, and conſequently from cauſing freſh Pains in the affected Part when it is inſerted into the Wound. The Edge of the Blade of theſe Siſſars muſt be very ſharp and keen, in order to make them cut the more eaſie and quick, and conſequently to cauſe the leaſt Pain to the Patient.

C. There is another Sort of Siſſars alſo, which are call'd the crooked or curved Siſſars, both the Blades being incurvated, for the Conveniency of making Inciſions in thoſe Parts or Places where there is no Opportunity of making Uſe of the ſtreight Siſſars. It has alſo a ſmall Button at the Point of the exterior Blade, or *Lamina*, being the ſame that is always conveyed into the Wound that is to be dilated. And here it is to be obſerved, that a Chirurgeon muſt not handle his Siſſars after the ſame Manner as the Women and Taylors do, who put their Thumb into one, and the *Index* into the other round Hole or Ring; but he muſt put the Annular Finger into the Second Hole inſtead of the *Index*, that ſo he may be able to manage them with more Dexterity and Strength; for by this Means the *Index* and the Middle Finger will reſt upon the Branches of the Siſſars, and will guide them the better in the Operation.

D. The *Raſor* is the moſt ancient among all the other Chirurgical Inſtruments. In former Times they made moſt frequently Uſe of it in all the Operations where Inciſions or Exciſions were required; but being not firm or ſteady at the Handle or Haft, and there being other much more uſeful Utenſils of that Kind invented ſince, we

ſcarce make any other Uſe of it now than to ſhave or clear the Places from the Hairs, where it is required it ſhould be ſmooth.

E. The *Diſſecting-Knife*, was indeed invented and appropriated to Anatomical Diſſections, but is nevertheleſs ſerviceable alſo in divers Chirurgical Operations, as in thoſe Amputations where the Fleſh and Membranes are to be cut away, as betwixt the Two Bones of the Arm and the Leg, before we apply the Saw. This Inſtrument is ſharp-edged on both Sides, with a Handle of Bone or Ivory, which being thin and flat at the Extremity, is adapted for the ſeparating of the membranous and fibrous Parts in the Anatomical Diſſections or Preparations.

F. There is another Sort of a *Diſſecting-Knife*, with a Back, *i. e.* having but One ſharp Edge; and the Blade is incurvated. It is very ſerviceable in caſe we are to looſen the Fleſh from the Body, when we are to embalm it, or ſet up a Skeleton.

G. There is another Sort of an Inſtrument belonging to Diſſections, call'd *Arrigne* (in *French*). Formerly it uſed to have Two crooked pointed Ends or Hooks; but this having been found inconvenient, it is made only with one now. This Hook was deſign'd for the taking Hold of and holding up of a Veſſel or Ligament, by a Servant or Aſſiſtant in the Anatomical Diſſections. When we are to make Uſe of them in Chirurgical Operations, we muſt take ſuch as have bluntiſh Points, for fear that if they ſhould wound ſome ſenſible Part, they might cauſe exceſſive Pains and Convulſions.

H. The *Lancet* is the moſt neceſſary of all the Chirurgical Inſtruments; without which, a Chirurgeon cannot adminiſter the moſt common Operation belonging to his Profeſſion: I mean Phlebotomy. Some are for very ſmall and ſharp-pointed Lancets; others are for having them ſomewhat broadiſh. The Firſt alledge, that they are better able to guide the Point of their Lancet into the Vein; and by raiſing it higher or lower, make the Orifice ſuch as they would have it: But the others pretend, that with the Help of a broadiſh Lancet, they can make the Orifice wide enough without being obliged to thruſt the Inſtrument within the Vein, and conſequently bleed without any conſiderable Pain, which is cauſed not ſo much by the Punction or Pricking of the Vein, as by the Raiſing or Cutting of it upwards. Thoſe that I make Uſe of are neither very broad nor very ſmall; ſo that in Bleeding I raiſe my Lancet but a very little, and conſequently the Pain is very inconſiderable. The Handle is commonly of Tortoiſe-ſhell: It muſt be ſmall, and made of Two Pieces join'd together, to keep them clean. 'Tis a Miſtake to have them tipp'd with Silver, becauſe it makes them more heavy.

I. There is another Sort of a Lancet, which is much bigger than the before-mentioned, being intended for ſuch Operations where long and deep Openings are requir'd, ſuch as cannot be accompliſhed by the ſmall Lancet. Neither the Point nor the Edge ought to be too thin and ſharp in this large Lancet, leſt it ſhould turn or blunt when it happens to touch upon ſome hard Membranes or Fleſh. For the reſt, a Lancet ought to be very flat, and well poliſhed, by which Means it may make the Orifice of the Vein the ſlenderer, and conſequently more eaſie to be healed up.

K. The Inſtrument that is call'd the *Probe* is very ſmall, round, and ſmooth all over, excepting at one End, where it is provided with a ſmall Head, to prevent its pricking the Wound that is to be ſearched. However there is a Difference betwixt the Probes, both in Reſpect of their Bigneſs and Length. 'Tis by the Means of the Probe we are made ſenſible of the Depth of a Wound, and which Way it goes: 'Tis by the Probe we underſtand whether ſome extraneous Matter is lodged within it; whether it has penetrated quite through, and whether it has reached to the Bones: And to be ſhort, it is the Probe that gives us the Firſt Inſight we ſtand in need of to proceed towards its Cure.

L. There is alſo a flat *Probe*, which ſtands us in no ſmall Stead in thoſe Places where the round Probe has no Admittance; as for Inſtance, in the Fiſſures of the Bones, or the Separation of the Skull, which makes it to be no leſs uſeful than the Firſt Probe.

M. There is a Third Sort of a *Probe*, hollowed out in the Nature of a Gutter, having a Concavity like a Pipe through its whole

whole Length, to conduct the Point of ſuch Inſtruments as are to make an Inciſion. 'Tis upon this Account that it is much bigger and much ſtronger than the Two preceding; and it has Two ſmall Handles at its Extremity, by which the Chirurgeon keeps it ſteady with his Left Hand whilſt he performs the Operation. Theſe Probes are moſt commonly made of Iron; but thoſe of Silver are much better.

N. The Inſtrument call'd the *Biſtoury* is frequently uſed by the Chirurgeons, and are of different Sorts: The Firſt has a ſharp keen Edge all along one Side; but on the other, which is call'd its Back, this ſharp Edge reaches but half Way. It may be laid backwatds and forwards like a Lancet wherewith we open an Abſceſs, and is uſed ſometimes inſtead of it; for it is very ſerviceable in making Inciſions of divers Sorts, but eſpecially in thoſe of the Head. I need not tell you, that when you make Uſe of theſe Inſtruments, you muſt take Hold with your Fingers immediately by the Blade, which turn in the Handle, which ſerve alſo to the Hand inſtead of a Counter-Ballance during the Operation.

O. There is another Sort of theſe Inſtruments, call'd the *ſtreight Biſtoury*, becauſe it does not turn in its Handle backwards as the former, but ſtands in a ſtreight Line, with its Handle like a common Knife. It cuts only on one Side, its Back being flat or broad. Sometimes we put a ſmall Button of Wax at its Point, to prevent its hurting any Thing, when we are obliged to convey it within a Wound. This Inſtrument is very uſeful to the Chirurgeons in the Field.

P. A Third Sort of this Inſtrument is call'd the *crooked Biſtoury*, ſhaped like unto a Half-Moon, the keen Edge of the Blade being on the Inſide, and the Back on the Outſide. They are diſtinguiſh'd into *ſmall*, *middling*, and *large*. Theſe laſt are call'd the *crooked Knives*, and are deſign'd for large Operations: However we never make Uſe of the *crooked Knife*, excepting in ſuch Caſes where the *ſtreight* will not anſwer our End; as for Inſtance, when in the Operation of the *Bubonocele*, we are to dilate the Rings of the *Muſculus Obliquus Deſcendens*, and then we put the Point of the *Biſtoury* within the Pipe of the hollow Probe, and ſo we may ſupercede to fix a Button to the Extremity of the Blade.

Q. The *Spatula* is a very neceſſary Inſtrument for Chirurgeons, wherewith they muſt make their Plaiſters, and ſpread the Ointments upon the Pledgets. It ought to be pretty ſtrong, broader at one End than at the other, flat on one Side, and convex on the oppoſite Part. Thoſe that are made of Silver are much neater and cleaner than thoſe of Iron.

R. The Inſtrument call'd by ſome the *Myrtle-Leaf*, from its Reſemblance, is by others call'd a *Demiſpatula*, becauſe it bears ſome Reſemblance to the Figure of a *Spatula*, but that it is always pointed at the End, not quite ſo broad, but thicker. It ſerves for the cleanſing of the outward Parts of the Wound, it being ſhaped at its Extremity like an Ear-pick, wherewith we pull ſome extraneous or adventitious Bodies out of the Ear, or ſome ſmall Stones that are fix'd within the *Urethra*.

S. There is another Inſtrument, call'd likewiſe the *Myrtle-Leaf*, which is much ſlenderer than the former, and ſharp-edged only half Way, being crooked like a Hook at its Extremity: Beſides that, it ſerves for the ſame Uſes that the former does. It is made Uſe of in Diſſections, to ſeparate the Membranes and the Filaments. I have always employed it with good Succeſs in the Operations of the *Bubonocele*, wherein I prefer it before the Inſtruments that have ſharp Edges, for fear of wounding the Inteſtine.

T. The *Elevatory* is an Inſtrument which has obtained its Denomination from its Uſe. They are of different Figures; of which, more in the following particular Operations. But that which I am ſpeaking of here is turned or incurvated at both its Extremities, one of which is four-ſquare, and the other round. The Firſt is to be conveyed into long and large Openings, and the latter into the round Holes. They are both indented on the Inſide, to prevent their Slipping aſide under the Bone that is to be lifted up. Sometimes it is made Uſe of alſo for the Extracting of ſome foreign Bodies, ſuch as Bullets, Pieces nf Granadoes, *&c.* But the main Deſign of this Inſtrument is to

liſt or raiſe up a Piece of a Bone that is thruſt inwards upon the *Dura Mater*.

V. The Chirurgeons uſe Pincers or Tweezers of divers Sorts and Figures, which have taken their Denominations from ſuch Things as they have a near Reſemblance to, as to the Beak of a *Raven*, *&c.* Each of theſe have alſo their peculiar Uſes, as will be ſhewn hereafter in the particular Operations. But there is a Pair of Pinchers which are ſo generally uſeful, that a Chirurgeon ought never to ſtir abroad without carrying them about him; and I would adviſe them rather to be of Silver than of Iron, becauſe this laſt is apt to turn ruſty. The ſuperior Extremity of this Pair of Pincers ſerves to pull the Hairs, or ſome Splinters of Bones, becauſe it has a Spring that keeps them conſtantly open; and the inferior Branches being longer than the ſuperior, they are very ſerviceable in taking Doſſils out, or reconveying them into a Wound.

X. The Needle is alſo a uſeful Inſtrument of Chirurgery, and is uſed upon ſo many Occaſions, that Chirurgeons ought to be provided with ſeveral Sorts of them; of which there will be ſufficient Occaſion to treat more at large hereafter in the Operations of the Sutures. But thoſe that are moſt commonly uſed in Anatomy are ſtreight ſharp-pointed Needles, the Two Sides of which grow a little broader, and are ſharp-edged to their Middle: The remaining Part is round, and has a Hole or Eye, through which you put the Thread. They are uſed to ſew up a Body after a publick Anatomical Demonſtration, as alſo when a Body is embalmed.

Y. There is another crooked Needle, which is intended for the ſame Uſe, but is much thicker and ſtronger than the former. It muſt be of a well-temper'd Steel, for elſe it will either bend or break, eſpecially when a dead Body is to be ſewed up, the Skin of which is much tougher and more difficult to be pierced through than in a living Body. It is deſigned for the ſame Uſes with the former; and beſides, this is very ſerviceable and abſolutely neceſſary in the Operations or Sutures of the Belly call'd *Gaſtroraphia*.

Z. The Saw is in Effect an Inſtrument which the Chirurgeons have in common with many other Artiſans: But the Saw that is made Uſe of by the Chirurgeons being more exact, and made by the beſt of Workmen, does moſt juſtly challenge the Preference before all the reſt, not only for its curious and neat Workmanſhip, but alſo for its prompt and exact Separation of the Parts unto which it is adminiſtred; for the Chirurgical Saw muſt be ſmall and light, that it may be managed with the more Freedom; and it has a Handle, to keep or hold it the more ſteady in your Hand during the Operation. 'Tis abſolutely requiſite that the Blade ſhould be of a very good Metal, and its Teeth very ſharp, that ſo they may ſaw through the Bones of an Arm or Leg, that are to ſuffer an Amputation, with the more Facility, and ſeparate them in as ſhort a Time as poſſibly can be. The Saw is alſo abſolutely neceſſary in the Operations or Overtures of the Skull, as alſo when a Head is to be embalmed, or the Brain to be expoſed to full View in the Anatomical Demonſtrations.

Theſe before-mention'd Inſtruments are only thoſe that are commonly known by the Name of *General*; beſides which there are a great many other, call'd *Particular*, each of which muſt be treated of more at large hereafter, in thoſe particular Operations unto which they belong.

Of the TENTS, *and the* CANULÆ *or* PIPES.

THE Tents challenge alſo none of the leaſt Places among the Implements of a Chirurgeon, there being ſo many Operations which abſolutely require them, that a Chirurgeon ought to be fully inſtructed in every Thing that does appertain to them; which may be reduced under Three Heads, to wit, their Materials, their Figure, and their Uſes.

There are Five different Matters of which you make your Tents, and chooſe ſuch as you find moſt uſeful to your preſent Pur-

poſe, for they are made of Lint, of Linen, of prepared Spunge, of Silver, and of Lead.

The *Tents* that are made of Lint are the ſofteſt and eaſieſt. They do not diſturb a Wound ſo much as the other Sorts do. They are made Uſe of to convey or keep a Medicine to the Bottom of a Wound. They imbibe the liquid or the moſt corroſive Part of the purulent Matter, and by this Means prevent this Excrement from proving detrimental to the wounded Part.

Thoſe *Tents* that are made of Linen are moſt commonly the largeſt of all, being alſo long and hard, and with a flat Head in the Nature of a Nail, which is broader than the other Part. This is done to prevent their ſlipping into the Cavity of the Breaſt or Belly, theſe being the Two Places where they are moſt frequently applied.

We call that a prepared Spunge which is boiled in Liquor, in which there is ſome Wax. Then you muſt take it whilſt it is very hot, and tie it up together with a fine Thread, in order to give it the Shape or Figure of a Tent.

Whenever there is any Occaſion for the Dilatation of a Wound, we put one of theſe *Tents* into it, which being fill'd with the Humours or Moiſture that is contained in the Ulcer, it ſwells to ſuch a Degree, that it is hardly to be pull'd out again. 'Tis for this Reaſon, that though its Uſe is commendable ſometimes, yet its conſtant Application is dangerous, becauſe after it is ſwell'd up, it will become ſo hard, that if it continues thus, it will make the Parts upon which it touches to turn callous or ſcirrhous.

Thoſe *Tents* made of Silver are call'd *Cannulæ*, or Pipes, becauſe they are hollow within all along like a Pipe. They are made after divers Ways, as ſhall be ſhewn anon; and are deſign'd for the conveying of ſuch Matters as are contained within the great Cavities outwards. They have this Conveniency, that with a ſmall *Tent* of Linen, which cloſes them, you may dreſs the Patient without taking them out of the Wound.

They are made alſo of Lead, of the ſame Shape and for the ſame Uſes as thoſe of Silver; and there are ſome Chirurgeons who prefer the Leaden Ones before thoſe of Silver, becauſe ſay they, Lead is very agreeable to humane Nature, beyond any other Metal, becauſe ſome Leaden Bullets have been lodged and continued in Men's Bodies for all their Life-time, without any conſiderable Inconveniency: But it may be anſwered, that theſe Leaden Balls did not prove incommodious by Reaſon of their Figure, which happened to be proportioned to thoſe Parts or Places where they were lodged; which alſo happened to be without the Compaſs of the Action of the moving Fibres, and the Courſe of the Juices or Humours: And ſuppoſing the Caſe to ſtand thus, I am apt to believe, that a Silver Bullet would ſtill prove leſs incommodious, becauſe being of a more ſolid and hard Subſtance, it will be apt to retain its Figure the longer, and the corroſive Juices will not have Power enough to make any Impreſſion upon it, ſo as to extract or abrade ſome of its metalick Particles. The beſt Conveniency I know of in the Leaden Tent or Pipe is, that a Chirurgeon may make one himſelf; whereas none but a Goldſmith can make one of Silver, which may not be at Hand upon all Occaſions, and oftentimes the Patient alſo is not in a Condition to pay for a Silver One.

Among theſe different Sorts of *Tents*, ſome are long, others ſhort; ſome ſlender, ſome thick; ſome flat, others round: But take this for a general Rule, That they muſt always be proportioned to the Figure, Bigneſs, and Depth, of the Wound, all which depends on the Diſcretion of the Chirurgeon, whoſe Buſineſs it is to make them ſuitable and anſwerable to the End they are intended for.

The Tents have Four different Uſes or Advantages belonging to them: The *Firſt* is, to convey the Medicines, and detain them cloſe within and to the very Bottom of the Wounds. The *Second* is, to abſorb or imbibe the purulent Matter, which elſe would ſtagnate or corrupt there, which is eaſily tranſmitted into the Pores of the Tents, the Air of which is rarified by the Heat of the Part. The *Third* Uſe is to keep a Wound open, and to prevent the upper Lips or Edges from reuniting together before the Bottom is fill'd up. And the *Fourth* is, to convey out of the Wound ſuch Matter

as

as muſt be brought out; which is the Reaſon that it is always put into the loweſt Place of the Wound.

But notwithſtanding all theſe Advantages that ariſe from the Uſe of the *Tents*, there are ſome Chirurgeons who do reject them. They tell us in the Firſt Place, That every Thing that cauſes a Pain in a Wound or Ulcer ought to be avoided, for fear of Fluxions and Inflammations, which are the Conſequences of it. *Secondly*, they ſay, that they rub and hurt the Fleſh by their Hardneſs, it being very tender, becauſe it is not covered with the Skin. They alledge in the *Third* Place, That a Tent ſtops up the Wound, and conſequently keeps the *Sanies* within the Wound, which is apt to corrode or exulcerate it. *Fourthly*, they pretend, that every Thing which hinders the Conſolidation of a Wound is to be avoided; and the Tents producing that Effect, they are not to be applied to the Wounds.

But it will prove no very difficult Task to anſwer all theſe Four Objections, or Reaſons. As to the *Firſt*, we are willing to grant, That above all Things we ought to endeavour not to occaſion any freſh Pains to the Patient, as much as poſſibly can be: But to anſwer this End, you need only make your *Tents* ſmall, ſmooth, and ſo well twiſted together, that they cannot wound any Part. As to the *Second*, I cannot ſo much as imagine how the *Tents* can occaſion a Contuſion in a Wound, for they ought to be ſo ſoft, as eaſily to give way to the Parts. In Oppoſition to the *Third*, I am fully ſatisfied, that the *Tent* which abſorbs the purulent Matter, prevents the Corroſion and Exulceration of the Wound; and were it not that the Tent or Lint did imbibe the *Sanies*, we ſhould be obliged either to dreſs the Wound much oftner, or elſe to manage the Tent in ſuch a Manner, as to make the ſuperfluous virulent Seroſity to iſſue from the Wound. In Anſwer to the *Fourth* Objection, I ſay, That in caſe a Chirurgeon ſuffers the *Tents* to continue too long in the Wound, it will hinder its Reunion: But the true Method of uſing them is to put them into the Wound at the Beginning, to open and forward the Extruſion of any foreign Matter, as the coagulated or extravaſated Blood; but afterwards when the Fleſh begins to appear of a ruddy natural Colour, the *Tents* muſt be taken out, to promote the Cicatrizing of the Wound; ſo that the Solution of this whole Queſtion does depend on or turn only upon this Point, That a Chirurgeon ought to know the true Time when to make Uſe of them, and when to remove them.

Among thoſe of our Modern Chirurgeons that reject the Uſe of Tents, Dilaters, *&c.* is Monſieur *Belloſte*, Chirurgeon-Major to the Hoſpitals of the *French* King's Army in *Italy*, in his *Hoſpital Chirurgeon*. He ſays, That moſt generally there are Four Uſes attributed to the Tents, to wit, (1.) To keep open the Orifice of a Wound. (2.) To convey the Medicines to the Bottom of them. (3.) To further the Coming away of foreign or extraneous Bodies. And, (4.) To imbibe and retain the purulent and excrementitious Matter therein generated. And that all theſe Four Ends may be attained, as far as they are expedient, without the Help of Tents, excepting when they are applied to contain and ſupport Adſtringents to ſtop Bleeding, or hinder the Reunion of a freſh Inciſion.

As to the Firſt End, he ſays, That Nature's Endeavours being always bent towards the Supplying of what has been taken away by violent Means from the *Body*, and reuniting the Separation made therein, there is no Reaſon for the Keeping open the *Orifice* of a Wound; but if there be Occaſion, it may be enlarged in the Firſt Dreſſing: That in *Gunſhot Wounds* they are not only uſeleſs, but alſo hurtful, which oftentimes are too much widened of themſelves by the Coming away of the bruiſed Fleſh, commonly call'd the *Eſcar*; which, ſays he, being a foreign Body, in Reſpect to thoſe Parts to which it immediately adheres, muſt of Neceſſity be ſeparated from them, becauſe Nature cannot effect a Reunion of the Fleſh till ſhe has freed herſelf of what keeps aſunder the Parts to be join'd together. The Separation of the *Eſcar* being a Work of Nature, the new Fleſh is eaſilieſt bred at the Bottom of the Wound, and conſequently the *Orifice* is laſt of all freed from the *Eſcar*, and ſupplied with new Fleſh.

The Wounds made by ſharp Inſtruments do not want to be dilated, and conſequently no Tents, becauſe they do thwart Nature's Intention.

Contuſed Wounds will not admit of an Union till what is bruiſed is removed, either by the natural Heat, or by diſſolving Remedies and Suppurations, and conſequently they do not ſtand in need of *Tents*.

As to the Second Uſe of *Tents*, *viz.* to convey the Remedies to the *Bottom* of the Wound; this, ſays he, may be obtained with much more Eaſe by giving a pretty ſoft and thin Conſiſtency to thoſe Ointments, *Balſams*, and other ſuch-like Medicines, as are to be applied for the Curing of the *Wounds*.

The Third End of *Tents*, which is to diſcharge the *extraneous Bodies*, is ſo far from being furthered by them, that they rather conduce to retain them, becauſe theſe Things are ſcarce ever drawn forth at the ſame Place by which they enter'd, unleſs it be at the Firſt or Second Dreſſing; and this happens but ſeldom, and never without great Pains, and much Time and Trouble.

A Leaden Bullet will by its Ponderoſity not remain long in a Place, unleſs it does ſtick in ſome Joint: But ſuppoſing the Fleſh did not give Way to its Weight, a Tent would rather fix it deeper into the Wound than bring it out. And ſince the *Matter* will follow the Bullet, it ferments in the Cavities, and produces a Fever. The ſame may be ſaid of the Shivers of Bones, and ſuch-like Things, *&c.*

Pieces of Garments, Linen, *&c.* which are carried by the Bullet into the Wound, will remain there oftentimes after the Bullet is drawn out, and prove the Occaſion of troubleſome Symptoms; but *Tents* are ſo far from bringing them out, that they rather keep them there, by ſhutting up the Paſſage through which it may be expelled.

For a *Tent* will ſwell in the Wound, fill up the Orifice, and keep in the Matter, which ſpreading it ſelf into the adjacent parts, glides betwixt the Muſcles, and carrying the extraneous Bodies along with it, thoſe begin to putrify, and at laſt occaſion Abſceſſes, if not Mortifications.

As for the Fourth End of the Tents in Wounds, which is to imbibe the Moiſture, it is granted that they do, but at the ſame Time they prevent its paſſing out of them; for being ſwelled up by this Imbibition, they intercept the Paſſage of all the other Matter that is generated: And this excrementitious Matter, which Nature is ſo ſollicitous to throw out, as being corrupted by its Abode, does alter and deſtroy the Conſtitution of the Parts that contain them, unleſs it be diſcharged another Way: And it is much ſafer and better to give it a free Paſſage, than to intercept its Courſe by *Tents*, *&c.*

But 'tis Time we ſhould return to Monſieur *Dionis*, who has given us the following Account of the Tents, and their particular Uſes.

A. The Firſt Sort, ſays he, is very ſmall, and made of Lint, twiſted together in ſuch a Manner, as to give it a Kind of a Head. It is put into the Orifices of the ſmall Ulcers, and dipp'd into or covered with a ſmall Quantity of ſome abſtirgent or mundicative Ointment or Subſtance, to clear the Wound of the Fleſh that has undergone an Alteration by the long Continuance of the purulent Matter.

B. The Second is much larger and longer than the Firſt, made likewiſe of Lint, with a Head, which prevents its ſlipping too deep into the Wound. It is very ſoft, that it may not wound the Part, and yet ſtrong enough to open its Paſſage, and keep the Wound from cloſing together. It muſt be dipp'd in ſome Liquids, or covered with ſome Ointment, and then is frequently uſed in many Wounds, but more eſpecially in freſh Wounds.

C. The Third is made alſo of Lint, but is much larger than either of the Two preceding, and of the ſame Thickneſs at its whole Length. This Tent requires the Hand of a dextrous Chirurgeon, and is uſed in ſeveral Sorts of Wounds, but more eſpecially in thoſe of the *Anus*, after the Operation of the *Fiſtula*.

D. The Fourth Sort of *Tents* is made of ſeveral ſmall Pieces of Linen, roll'd one upon another, being flat, and ſome of the Threads drawn out at the Point, to prevent its hurting the Parts upon which it is to touch: And notwithſtanding it has a large Head, made of Linen alſo, it is nevertheleſs

leſs provided with a long Thread, in order to pull it back, in caſe it ſhould happen to ſlip into ſome Concavity; for it is made Uſe of in the *Gaſtroraphia*, and is applied to the inferior Part of the Wound, in order to keep open a Paſſage.

E. The Fifth is a large *Cannula* or Pipe of Silver, as well as the Four next following. It is provided with Two ſmall Rings on the Two Sides of the Head, through which we draw a String, to keep it down in the Wound: And though it is hollow from one End to the other, it has nevertheleſs Two ſmall Holes near its Extremity, for the eaſier Paſſage of the *Matter* or *Urine*, in caſe the Opening which is at the Extremity of the Pipe ſhould be obſtructed by the Membranes of the Bladder, ſome other ſmall Membranes, or the Clods of the congealed Blood, which do ſometimes enter within the hollow Part at its Extremity. This Sort of *Tents* is chiefly made Uſe of after Lithotomy, or the Punction of the *Peritonæum*.

F. There is another Sort of a *Pipe*, call'd the *flat-headed Pipe*, becauſe at its Head it has a ſmall, round, flat Plate, with Two Holes in it, through which we draw a String, being more ſerviceable in the *Empicuma*, or rather in the *Parentheſis*, than that which has Rings at its End, becauſe the Water and purulent Matter are better retained by a flat Plate, applied cloſe to the Skin round the exterior Orifice of the Wound or Opening that has been made by the Operation.

G. There is another Sort of a *flat-headed Pipe*, made after the ſame Manner as the next preceding, excepting that in this the *Body* of the Pipe is *oval* like a Cylinder, with Two flat Sides; whereas the *Body* of the preceding is exactly round like a common Cylinder. This Pipe was invented to ſerve in ſuch Places where there is not a ſufficient Entrance or Admittance for the round Pipe, by reaſon of their Streightneſs.

H. There is alſo a *crooked Pipe*, provided likewiſe with a flat Head, and ſerves for the ſame Uſes as the former, but its Body is incurvated, the better to accommodate it to the Figure of the Wounds, where the ſtreight Pipes have no Admittance.

I. The laſt Sort of theſe Pipes is very ſmall, and has Two little Rings at its Head; and its End, which is to be conveyed within the Wound, is bored through on the Side with Two Holes, one above the other, to give Paſſage to the Air, which enters through the Mouth, after the Operation call'd the *Bronchotomy*, for which Uſe it is deſigned in particular.

I have thought fit to inſert in this Place the *Setons* among the *Tents*, becauſe both of them ſerve for and anſwer the ſame Intention; and the Effects they produce have a very near Relation one to the other.

K. A *Seton* we call that ſmall *Cord* which is drawn through a Wound, from its Entrance to its Egreſs. This *Cord* was in former Times made of Horſe-Hair; but it having been found by Experience, that it did cut and vex the Wound, ſome have made Uſe of twiſted Cotton, ſuch as are uſed in the Lamps; and others of the Thread of Hemp twiſted or join'd together: But for my own Part, I always have found a ſmall Piece or Band of Linen Cloth the beſt, becauſe Linen is moſt agreeable to the Wounds.

L. When you intend to convey the *Seton* through the Wound, you muſt be provided with a ſmall Inſtrument, call'd the *Seton-Needle*. It is round, and at its Extremity is provided with a Head, to prevent its wounding or pricking the Sides of the Wound in its Paſſage through it. It is perforated with a large Hole near the Head through which the *Seton* is threaded. It muſt be of a conſiderable Length, ſufficient to reach from the Entrance of the Wound to the other Orifice, or its Egreſs, as in the Wounds of the Thigh, which reach quite through it.

The *Seton* is of ſingular Uſe for the conveying of a Medicine or Remedy all along and quite through the Wound. It muſt be of a great Length, becauſe ſo often as you dreſs the Wound, you muſt draw out the Part which has been within the Wound and convey into it another, which muſt be covered with an Ointment, as far as it is neceſſary to be inſerted into and to occupy the whole Length or Extent of the Wound; which done, you muſt cut off that part which has been drawn out, and bring away the purulent Matter with it. If it happens, that you have uſed up all the *S*

and after that ſtand in need of ſome more, you muſt not draw another *Seton* through the Wound with the *Seton-Needle*, but you muſt tie it to the End of the other that falls ſhort. 'Tis further obſervable, that you muſt always make your *Seton* enter through the upper Part of the Wound, and to make it paſs out at the lower Part of it.

Some will perhaps be apt to object, That the *Seton* being an extraneous Body, which is conveyed into the Wound, ought not to be made Uſe of in Wounds: But conſidering that it ſerves for the ſame Purpoſes as the *Tents* do, to wit, to prevent the Orifices at the Entrance and Egreſs of the Wound, from cloſing up before its interior Part, and to convey the Remedies through its whole Extent, as alſo to promote the carrying of the noxious Matter outwards, *&c.* there are many Caſes, doubtleſs where they cannot be omitted. The Wound being once well cleanſed, you remove the *Seton*, and the Wound will heal up without much Trouble.

'Tis impoſſible to preſcribe any exact Time how long the *Seton* is to be kept in the Wound: This muſt be left to the Diſcretion of the Chirurgeon, who ought to regulate himſelf in this Point according to the Circumſtances of the Wound; for ſome Wounds require more of a Deterſion or Purgation than others; as for Inſtance, a Wound made by a Shot requires a longer Continuance of the *Seton* within it, than one that is made by a Sword: But great Care muſt be taken not to leave it too long within the Wound, which would render it callous, and produce a *Fiſtula*.

By the *Seton* I am treating of in this Place, muſt be underſtood that Piece of Cotton, or of a ſmall Bandage, which is conveyed into and detained for ſome Days; for it is beyond my preſent Purpoſe to ſpeak of that Operation of the *Seton*, which is made in the Nape of the Neck; of which we ſhall have Occaſion to treat more at large hereafter in its proper Place.

Of the PLEDGETS.

WHEN, after an Operation, a Wound requires a *Tent* or a *Pipe*, we make Uſe of one of thoſe we have deſcribed in the preceding Chapter; but in ſuch Wounds as may be managed without them, we uſe *Pledgits*, which are the Drawings of Linen or Lint, which are put into the Cavity, and the Wound is alſo covered with them.

The ancient Chirurgeons uſed to ſew Feathers betwixt Two Pieces of Linen, to make up their Pledgets, being not only very proper to imbibe the *Matter*, but alſo to defend the affected Part againſt the cold Air, which is always an Enemy to Wounds and Ulcers, becauſe it tears aſunder their Fibres, which are very ſmall, ſpoils their natural Diſpoſition, and conſequently ſtops or interrupts the Motion of that Juice which is to repair or make up its Defect of Continuity.

'Tis further obſervable, that in former Times they made uſe of a Kind of Muſhroom to dreſs their Wounds with; ſince which, ſome have made Uſe of Toe or Flax, others of Cotton and Spunges: But in our Days, ſince Linen is become ſo common among us, we have laid aſide the Uſe of all the other Matters, and make Uſe of no other Thing but Lint, which doubtleſs is to be preferred before every Thing that the Ancients applied in theſe Caſes.

The Lint is made of Linen, pull'd out into Threads. When you intend to make Lint, you tear a Piece of Linen Cloth into many ſmall Pieces, and out of them draw the Threads one after another. The Linen muſt not be too coarſe nor too fine; not too new nor too old: The Firſt produces a Lint that is too harſh, and hurts the Wound, and requires a great deal of Time to pull it aſunder into Threads. As to the Second and Third, if it is too fine, the Threads will run together; and if new, they are rough and hard. And the Fourth Sort, I mean, if it be too old, it falls aſunder, or makes a Lint like Cotton; ſo that it muſt keep a *Medium* betwixt theſe Four Qualities;

but above all Things, take Care it be clean and white, without Soap or Lie in it.

Of this Linen we make our Pledgits and Doſſils; unto which you muſt give ſuch a Figure as you find moſt ſuitable to the Wound, in order to apply them, either dry, or covered with Ointments, or dipp'd into ſome Liquor or other, ſuch as you judge moſt proper for the End it is deſign'd for.

The Pledgits and the Doſſils have Five very conſiderable Uſes. The Firſt Uſe is to ſtop the Blood, which oftentimes runs in abundance from the Wounds; and 'tis for this Reaſon that in the Firſt Dreſſing we do moſt commonly apply nothing elſe but dry Lint into the Wound. Their Second Uſe is to keep, by the Means of them, a Wound dilated or open, when we are to endeavour the Expulſion of ſome extraneous Body. Their Third Uſe is to convey the Remedies into all the Parts of a Wound. Fourthly, they ſerve to imbibe the virulent Matters and Seroſities which iſſue from the Wound, and conſequently prevent its being corrupted. And laſtly, they defend the Wound againſt the Impreſſions which the cold Air, impregnated with noxious Particles, might make upon them: But this laſt Uſe ſeems to appertain in a more peculiar Manner to the flat Pledgits, that are laid upon the Outſide of the Wound.

There is a Way of preparing a Kind of Lint, which does conſume and eat away the proud Fleſh which grows in the Wounds and Ulcers. To anſwer this End, they waſh and ſmooth the Linen Rags with Brimſtone, Nitre, and ſuch-like Things, and then draw it out into Lint. Sometimes we make Uſe alſo of a ſhaven Lint, which is made by ſhaving a Piece of Linen Cloth with a Kniſe. This Kind of Lint is very fine, and its chief Uſe is to dry or exſiccate a Wound, and to diſpoſe it the ſooner for Cicatrization.

Some Pledgits are made round, and are call'd Doſſils; and others are flat: The Firſt Sort are deſigned to fill up a Wound, and the Second to cover it. The Firſt are moſt commonly of an oval Figure, and the latter are ſometimes round, and ſometimes of an oval Figure; as may be ſeen in the Figure.

A, B, C. Among theſe Three mark'd with *A, B, C.* one is very ſmall, the Second of a middle-ſize, and the Third is the biggeſt of all. They are made of Lint twiſted together, and in their Figure reſemble to an Olive-Stone or Kernel. They are always made harder when they are intended for the Dilatation of the Orifice of a Wound; but in caſe your Intention is only to convey the Remedies into, or to abſorb the purulent Matter in the Wound, they muſt be made very ſoft, to prevent their rubbing againſt or impairing the affected Part, or to cauſe a Contuſion. If it be a ſmall Wound, you muſt apply the ſmall; but if it be large and deep, you muſt make Uſe of the bigger: But after all, it is more proper to fill up the Wound with ſeveral of them at a Time that are leſs.

D, E. The Two Doſſils mark'd with *D, E.* are of the ſame Figure with the Three preceding, but are much larger. They have a Thread tied about the Middle of them, of the Length of Four or Five Inches. Theſe we put firſt of all at the Bottom of a Wound, or of a very large Ulcer; but you need only tie a Thread to the Two or Three Firſt that are to be put into the Wound; for the reſt have no Need of it, becauſe they being put in after the others, will come out together with them, when they are pull'd out by the Thread; for this Thread pulls them aſunder, and ſhews whether there are any of them left in the Wound or not, becauſe thoſe unto which the Threads are faſten'd are the laſt of all that come out.

The large Doſſil, *F.* is faſten'd to a double Thread near its Head; for being adapted exactly to the Capaciouſneſs of the Wound, it happens ſometimes that it ſwells in ſuch a Manner within the Wound, and preſſes ſo hard upon it, that it requires a very ſtrong Thread to pull it out. This is chiefly made Uſe of after the Operation of the *Bubonocele*, to ſtop up the Opening which is made in the Muſcles of the *Abdomen*, in order to make the *Epiploon*, or the Inteſtines, re-enter into the Cavity.

G, H. The Two flat *Pledgits*, mark'd with *G, H.* are of a round Figure; one of them is ſmall, and the other ſomething larger, proportionable to the Place or Part unto

to which it is to be applied. They ought not to be very thick; and it requires a well-exerciſed and dextrous Chirurgeon to ſhape it exactly well.

I, K. The Two laſt, marked with *I, K.* are Two large *Pledgits*, flat, and of an oval Figure. They are very frequently uſed, and we moſt commonly uſe a good Number at a Time, and put one to the Side of another in very large Wounds. The Chirurgeon ought always to take Care to be provided with a greater Number of them than there ſeems to be Occaſion for; for it often happens, that we are obliged to put ſeveral one upon another, eſpecially when we are to ſtop an obſtinate Flux of Blood, which requires a conſiderable Compreſſion of the Arteries and Veins, from whence the Blood iſſue. This Intention is moſt commonly beſt of all obtained by this Meane, which ſerves to ſtrengthen the Ligatures, which were thought convenient to be made upon the Veſſels, and retain the Powders and Stipticks for a much longer Time upon the Openings or Orifices.

Of the EMPLASTERS.

THE Emplaſters are of a much more ſolid Compoſition than the Ointments or *Cerates*, and muſt be made ſoft before they can be ſpread upon Linen or Leather. They are applied externally to all Parts of the Body. The Diſtinction of the Plaiſters depends on their *Matter*, *Figures*, and *Uſes*.

This Matter is divided again into Two Sorts, to wit, the Stuff whereof they are made, and the Compoſition which is ſpread upon that Stuff. Sometimes when we are to apply an Emplaſter to ſome very tender Part, as to the Lips or the Eyes, we make Uſe of Silk, and fine Linen; but ſuch as are to be applied to the ſtronger Parts, as the Legs, the Arms, *&c.* of coarſe Linen or Leather. As to the Compoſition, 'tis very hard to determine or ſpecify it; for there is ſcarce any Thing to be named but what ſometime or other enters into the Compoſition of Emplaſters: Wax, Pitch, Oil, and Greaſe, are the moſt common Ingredients of Emplaſters; and theſe are mixed with Lythargy, Ceruſe, Gums, Liquors, and an infinite Sort of Powders, according to the Nature of the Emplaſter that is to be made, and the Proprieties that are required for the Cure of the affected Part unto which it is to be applied.

Among all theſe different Sorts of Drugs, ſome make up the Baſis of the Emplaſter, or give it its Body, and the reſt are mixed with them, to communicate and infuſe into them their Virtues, as well as to the affected Part unto which they are applied. By the true Mixture and Coction of all theſe ſeveral Ingredients is formed or produced a certain Maſs, which is apt to ſtick very eaſie and cloſe, and may be kept for a conſiderable Time in Rolls, without loſing any Thing of its Virtue. Unto this Kind of Remedy, which has been invented by the Antients, for the fomenting, ſoftening and ſtrengthening of the Parts, they have given an indifferent hard Conſiſtency, ſuch as is moſt fitly qualified to ſtick to the Wound for ſeveral Hours or Days without melting. Before you make Uſe of the Compoſition, you muſt hold it near the Fire, in order to make it ſoft, and fit it for the ſpreading of it upon ſome ſoft Stuff.

The Emplaſters are of ſo many different Figures, that 'tis next to an Impoſſibility to mention them all here: We will therefore comprehend them under Two general Sorts, or Figures, to wit, the *ſtreight*, and the *crooked*.

Unto the *Firſt* Sort appertain all thoſe Emplaſters that are comprehended within the Compaſs of ſtreight Lines, as are thoſe of a four-ſquare or of an oblong-ſquare Figure; and to the *Second*, all ſuch Emplaſters as have an incurvated Circumference, as the round Ones, the oval, and thoſe made in the Shape of a Croſs; and theſe are ſubdivided again into the leſſer, middle-ſiz'd, and large Emplaſter, which muſt be accommodated to the Figure and Bigneſs of the Wound or Part unto which they are to be applied.

Beſides this, the Emplaſters are diſtinguiſh'd alſo into *Univerſal*, ſuch as may be fitly ap-

plied to all the Parts of the Body: Of this Kind are the round and ſquare Emplaſters; and into *Particular*, ſuch as are ſerviceable to ſeveral Parts of the Body, but not to all, and are made like a Croſs of *Maltha*. The Third Sort are call'd *Singular*, becauſe each of them is adapted only to one Part of the Body, as to the *Perinæum* in the *Lithotomy*.

The general Uſe of Emplaſters is to contain or retain the other Remedies that are applied within or upon the Surface of the Wound; but in *particular*, to communicate to the Wound the Virtues of thoſe Medicines whereof they are compoſed. 'Tis in Regard of this laſt, that ſome Emplaſters do exſiccate and cicatrize a Wound, as the *Empl. Diapalma*; others promote the Concoction and Digeſtion of the purulent Matter, as the *Diachiton*; others cleanſe and expel, as the *Empl. Mundicativum*; others are Emollients and Diſpergents, as the *Diabotanum*; and ſo with the reſt.

The Twelve Figures marked with the Letters *A*, *B*, *C*, *&c.* repreſent ſo many different Plaiſters, all which muſt have at their Circumference an Edge of the Breadth of one or two Lines, which muſt not be cover'd with the Compoſition.

A. The Firſt is round, and the moſt commonly uſed.

B. The Second is four-ſquare: Some of theſe are large, others very ſmall.

C. The Third is of an oval Figure, *i. e.* it is longer than it is broad, of a rotund Figure. It is applied to ſuch Wounds as are much longer than broad; and they are clip'd in on the Circumference with the Siſſars, to make them ſtick the better over the Pledgits.

D. The Fourth is of an oblong-ſquare Figure, and is made Uſe of when you are to apply an Emplaſter round an Arm or Leg in a Fracture. There are ſome of the ſame Figure which are much ſmaller, being deſign'd to be applied to the Finger.

E. The Fifth is made in the Form of a Half-Moon, and is deſign'd for the *Fiſtula* of the *Anus*, when it is ſeated on one Side. Sometimes we cut ſome very ſmall Ones of this Figure for the Eyelids.

F. The Sixth is a triangular Emplaſter, being adapted to the Inciſion in the *Bubocenele*. We make Uſe alſo of triangular Emplaſters in the *Fiſtula Lacrymalis*; but theſe are much ſmaller than the former.

G. The Seventh is cut in the Shape of a Croſs of *Maltha*, and is very uſeful for to be applied to the Extremity of a Member after Amputation. In the ſame Manner we make a very ſmall Emplaſter, to be applied after the Amputation of a Finger.

H. The Eighth is call'd the *Window*, becauſe this Emplaſter is cut through in the Middle. It is of Uſe in Fractures that are attended by a Wound; for by the Means of this Hole we may dreſs the Wound, without being obliged to remove the Plaiſter that is applied to the Parts round about it. 'Tis uſeful alſo in the *Bronchotomy*.

I. The Ninth is call'd the *Trapezia* Emplaſter. It is clip'd inward at Two of its Extremities, for the Conveniency of its being applied to ſuch Parts as are rugged and unequal.

K. The Tenth is call'd the *Eſcutcheon* from its Figure. We moſt commonly cut our Emplaſters in this Shape when we are to apply a large Viſicatory or Bliſtering-Plaiſter betwixt the Two Shoulder-Blades.

L. The Eleventh is call'd the *Empl. Ypſi-loides*, from its Reſemblance to the Greek Letter ϒ. This is applied alſo to the *Perinæum*, after the Operation of the *Lithotomy*.

M. The Twelfth has obtained the Name of the Letter T, from its Reſemblance to it. It is applied to ſuch Inciſions as have the Figure.

There are beſides theſe many other Sorts of Emplaſters, which were not thought fit to be mentioned here, becauſe it depends chiefly on the *Genius* and Judgment of the Chirurgeon to contrive and give them ſuch a Figure as he finds them moſt ſuitable to the Part, and the Wound unto which they are to be applied.

Of the COMPRESSES.

THE Compreſſes are certain Pieces of Linen doubled together ſeveral Times, deſigned for the covering or ſurrounding of ſome Part. They are applied either dry or dip'd in ſome Liquor, according to the different Intention of the Chirurgeon.

They are call'd Compreſſes, becauſe they make a Compreſſion on that Part unto which they are applied: And becauſe this Compreſſion may be made equally in every Part, as of Neceſſity it ought to be, 'tis requiſite they ſhould have no Seams or Inequalities, a Circumſtance which ought not to be neglected by a Chirurgeon, in Relation to all the Linen Materials he makes Uſe of in the dreſſing of wounded Perſons.

To form to your ſelf a true *Idea* of the Compreſſes, you muſt obſerve Three Things in them, to wit, of what Materials, in what Manner, and for what End they are made.

As to the Materials of the Compreſſes, they are always made of Linen, which muſt be very cloſe, ſoft, neat, and white. They muſt be of a conſiderable Thickneſs when we intend to make a hard Compreſſion, or to defend the Part againſt the Air in a very cold Seaſon. They muſt never be made of new Linen, it being a general Rule of Chirurgery not to make Uſe of any other Linen but what is half worn, which is more pliable and ſoft than the other.

As to what relates to the Figure and Sizes of the Compreſſes, we can do no more in this Place than only to give you ſome general Rules, becauſe they muſt be adapted and made proportionable to the Figure of the Part, and the Conveniency of the wounded Perſon, and to a Thouſand Circumſtances that relate to the Wound it ſelf: We will therefore only tell you in this Place, that it is requiſite they ſhould always be about One or Two Inches Breadth, larger on all Sides than the Plaiſter upon which they are to be laid.

For the reſt, ſome Compreſſes are four-ſquare, ſome triangular, longitudinal, tranſverſal, circular, and of divers other Figures; for we do not proceed with the ſame Regularity in the Compreſſes as in the Emplaſters. The moſt uſeful of them I have repreſented in the Figure, whereof I will give you the Explanation, after I have ſaid only a Word or Two concerning their Uſes.

The Compreſſes do ſerve for Five Uſes: *Firſt*, they ſecure and ſtrengthen the Bandages. *Secondly*, they preſerve the Heat of the Part, by defending it againſt the Cold. *Thirdly*, they ſerve as a Means to keep the liquid Remedy wherewith they are moiſten'd upon the Part. *Fourthly*, they fill up the Inequalities of an Arm or a Leg, and by this Means give us an Opportunity of faſtening the Bandage with more Eaſe and Conveniency. And *Fifthly*, they prevent the Splinters from cauſing a Compreſſion or Excoriation in the Part, by introducing too violent an Extenſion, becauſe in ſuch Caſes we take Care to ſurround it with a circular Compreſs.

A. The Firſt among theſe Compreſſes is the Four-ſquare Compreſs, being that which is moſt frequently uſed, and adapted to abundance of Wounds, and to abundance of the Parts of the humane Body, provided they are made either larger or ſmaller, according as Occaſion requires.

B. The Second of theſe Compreſſes is by the Ancients call'd the Splenique Compreſs; for being much longer than it is broad, it has ſome Reſemblance to the Figure of the *Spleen*. It has beſides this obtained ſeveral other Denominations, taken from the different Manner of its Application; for when it is applied lengthways, it is call'd the *long Compreſs*; when tranſverſedly, it is ſtiled the *tranſverſal*; and when obliquely, the *oblique Compreſs*.

C. The Third is call'd the *longitudinal Compreſs*, when it is applied lengthways to a Leg or to an Arm; but it is ſtiled the *circular Compreſs*, whenever it is to be put all round about any of theſe Parts. It is much more narrow than long; and it is ſeldom

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put lengthways upon the Part without a Stay upon it: But when it is applied in a circular Form, it is done to render a Member eaqul, or to prevent the Splinters from causingany Pain in the affected Part.

D. The Fourth is a *circular Compreſs*, ſplit or cut aſunder to its Middle from one of its *Chiefs* or Heads, which is done to facilitate or adapt its Application to the Inequalities of ſome Part, and to the Fractures of the Arm and Leg, this Compreſs being abſolutely neceſſary for theſe Occaſions.

E. The Fifth Sort of the Compreſſes is call'd the Triangular, from its Figure. It muſt be very thick, becauſe it is intended for a very hard Compreſſion, to prevent the *Epiploon*, or the Inteſtines, from falling out through the dilated Rings of the Muſcles of the *Abdomen.*

F. The Sixth is ſhaped in Form of a *Maltheſe* Croſs, that it may the better embrace or ſurround the Extremity of a Member where an Amputation is made; for 'tis particularly in thoſe Caſes that it is made Uſe of. You muſt make it pointed at each Angle; without which the different Pieces of the Linen which make up its Thickneſs would be diſcompoſed when you are to apply it.

G. The Seventh is call'd the *Window-like Compreſs*, becauſe it has a Hole or Opening in the Middle, to give Liberty to the Air to paſs in and out through the *Arteria Trachæa*, after the Operation of the *Bronchotomy.* This Compreſs is very uſeful alſo in the Fractures that are attended with Wounds.

H. The Eighth is call'd the *Trapezial Compreſs*, becauſe its Figure is like unto that of the Emplaſter of that Name, *i. e.* it is ſplit or cut at its Two Extremities, to facilitate its Application to thoſe Members or Parts that have an unequal Surface, unto which it is always applied in a circular Form.

I. The Ninth is a large four-ſquare Compreſs, ſplit or cut from its Two inferior Angles towards its middle Part, in order to adapt it the better to the Figure of the Shoulder, which it is to cover, in the Luxations of the *Humerus* with the *Omoplata.*

K. The Tenth Compreſs is call'd the *Lozenge*, becauſe its Sides or Parts, of which there are Six, make oblique Angles betwixt one another; among which, thoſe that are oppoſite to one another are equal as well as the Sides. Chirurgeons oftentimes rather chooſe this Figure for a Compreſs than to take the Trouble to make it round, becauſe it ſerves for the ſame Uſes as the *circular Compreſs*; for it is much more eaſie and ready to ſhape or cut thus into a ſtreight Line the Four Angles of a four-ſquare Compreſs, which is the moſt common of all the reſt, than to give it an exact Rotundity.

L. The Eleventh Sort of Compreſſes is compoſed of Three narrow and long Compreſſes, the Two oblique Ones of which croſs one another in Form of a Croſs of St. *Andrew*'s, and the Third, which is plac'd vertically, tranſverſes the other through their pointed Angles. They are applied in this Poſition with good Succeſs in the *Ancuriſme*, and the *Varices*; for there being Three Compreſſes in the Middle, it makes a very firm and ſtrong Compreſſion upon that Part where there is a Relaxation or Overture of the Veſſel.

M. The Twelfth is a roundiſh Compreſs. Some of them are perfectly round like a Bullet, and others are only round on one Side like a Demi-Globe. Both of theſe Sorts of Compreſſes are applied under the Arm-Pits, before we put on the Bandages, after the Reduction of a luxated *Humerus.* We alſo put one of thoſe Compreſſes in the Hand of thoſe Perſons whoſe Bones of the Arm have either been fractured or diſlocated.

N, N. There are beſides theſe alſo ſome very ſmall Compreſſes, mark'd with *N, N.* being Four-ſquare, and thick, which are uſed after Phlebotomy adminiſtred to the Arm or Foot.

O, O. Thoſe mark'd with *O, O.* are of a longiſh Figure, which ſerve for the Ligatures of the Veſſels, to faſten the Thread upon.

P, P. The Two others, mark'd with *P, P.* are roll'd together, and very ſmall, and are applied to the Sutures, but eſpecially to thoſe of the Tendons.

Of the BANDAGES.

AFTER you have provided a Wound with *Tents* and *Pledgits*, and cover'd it with Emplaſter and Compreſs, you put a Concluſion to the Dreſſing of the Wound by the Bandage, which is nothing elſe but a Circumvolution or Winding about of the *Bands* done with Dexterity round ſome Part of the Body, either for the Preſervation or Reſtitution of its Health.

But before you learn how to apply a *Bandage*, you muſt know firſt what a *Band* is. A *Band* is call'd a broad and long Fillet or Piece of Linen Cloth, wherewith we either cover or ſurround thoſe Parts that ſtand in Need of it, for their Reſtitution or Reeſtabliſhment. You muſt therefore well obſerve what Difference there is betwixt a *Band* and a *Bandage*. The *Band* is at the ſame Time the Inſtrument and the Material of which the *Bandage* is made, and the *Bandage* comprehends the Uſe and Application of the *Band*.

The *Bands* do differ one from another in divers Reſpects, to wit, in their *Materials*; for ſome are of Leather, ſome of Linen. In their *Figure*, which muſt be proportionated and adapted to the ſeveral Parts unto which they are applied. By their *Size* or *Bigneſs*, for ſome are both broad and long, others are ſhort and narrow; others again are ſhort and broad, and others long and narrow. Or elſe by their *Structure*, which is either more or leſs artificial, becauſe ſome of them muſt be torn into divers Pieces for ſeveral particular Uſes. Others are ready made to the Chirurgeon's Hands, as a Napkin, a Girdle, or Saſh, *&c.* for common Uſes.

You muſt further obſerve in a Band its Body, which is its broadeſt and ſtrongeſt Part. Its Extremities muſt be taken either according to its Length, or to its Breadth; and theſe are call'd the *Chiefs*; ſo that let a Band be never ſo ſmall, it has always Four Chiefs, becauſe it muſt of Neceſſity have Two Extremities in its Length, and as many in its Breadth.

Moſt of the *Bands* reſemble unto a *Parallelogrammum Rectangulum*, or an oblong Square; but ſometimes we make divers Inciſions at their Ends, or elſe in the Middle, as you ſee them repreſented in the ſeveral Figures, and mark'd with the Letters.

They tell us, that if a Band is to be compleat, it muſt have theſe Four following Qualifications: The *Firſt* is, That the Materials ſhould be very good, *i. e.* that if it is made of Linen, it muſt not be of ſuch as is either to old or too new, that it may be ſoft and pliable, light and thin. The *Second* is, that it ſhould be neat and clean, for fear it ſhould communicate any ill Quality to the affected Part. The *Third* is, that it ſhould be made of a plain and even Linen, ſuch as is not wrought into Figures, and that it ſhould be cut according to the Thread. The *Fourth* is, that it ſhould be even and ſmooth, without any Seams or Knobs, like the Compreſſes, for fear of hurting the wounded Perſon. Unto this you may add, that if you would have your Band very compleat, it ought to be without a Salvage.

For the reſt, you muſt very near take the ſame Precautions, if you propoſe to make your Bands either of Leather, or of ſome Stuff.

The *Bandages* are either *common* or *proper*. The *common* may be applied to ſeveral Parts for divers Diſeaſes, as the ſimple Bandages, both the *equal* and *unequal* Ones; but the *proper* Bandages are adapted only to ſome certain Part, and ſome peculiar Diſeaſes: So that the Number of this laſt Sort is no leſs than there are different Parts of the Body. 'Tis upon this Account that I will not pretend in this Place to enter upon a particular Explication of them all, becauſe an Undertaking of this Nature would require a whole Courſe by it ſelf; but will confine my ſelf at this Time to thoſe Bandages, that are neceſſary to make you comprehend thoſe Operations which I intend to make the Subject Matter of the following Demonſtrations.

A Bandage is diſtinguiſh'd into a *ſimple* or *compounded* Bandage. We call that *ſimple* which is made by one Sort of Winding or Turning only, and which is accompliſhed by one ſingle Band, of which nothing has been taken off, or added to. This *Bandage* is again ſubdivided into Two Sorts, to wit, the *equal*, or *unequal*: The equal ſimple Bandage is circular, which is extended quite round ſome Part like a Ring upon the Water. The *Band* terminates without any Diſparity of its Circuits or Circumvolutions.

The *ſimple unequal Band* is ſubdivided into Four different Sorts. That Sort is call'd the *Doloire* (in *French*), when the Turnings or Circumvolutions do only lower a little, as they are roll'd upon and cover one another. That Sort is call'd *Mouſſe*, when they decline ſomewhat more from one another. That Sort is call'd the *Rampant*, when they are at ſuch a Diſtance from one another, as to leave ſome open Spaces betwixt their Rollings. And that Sort is call'd *Renverſee*, when by the Inequality of the Part the Chirurgeon is obliged to make many Turns backwards and forwards both above and below. The *compounded Bandage* is made up of ſeveral Bands join'd together, or of one Band cut aſunder into ſeveral Parts or *Chiefs*.

All the *Bandages* are not begun nor finiſhed after the ſame Manner; for ſome do begin at one of the Extremities of the *Band*, ſuch are thoſe made Uſe of in the Fractures; others at ſome Diſtance from one of their Extremities or Ends, as thoſe uſed in Phlebotomy; or ſometimes alſo at the Middle of the *Band*.

Sometimes we do apply the Firſt *Chief* of the *Band* to the affected Part, ſometimes to the adjacent Part of it, and ſometimes to the oppoſite Part, or ſome other that is at a good Diſtance from it; but at all Times according to the Intention for which the Bandage is deſigned: But you muſt always take Care not to finiſh it, or leave its laſt Extremity upon the Part where the Wound is, becauſe the Pin wherewith you muſt pin it together, or faſten the laſt End, would certainly produce ſome Pain in that Part.

The *Bandages* are ſubſervient to the Remedies, and ſerve alſo inſtead of the Remedies themſelves. The Number of theſe laſt is very large; for all the Bandages applied to the Fractures and Luxations, are almoſt the only Remedies that perform the Cure.

The Bandages have obtained different Denominations from the different Uſes they are applied to. Thoſe are call'd *Incarnatives* which draw or keep the Lips of a Wound one to another. *Expulſives* are call'd thoſe which expel the purulent Matter of the Wounds or Ulcers outwards. Theſe Affections are commonly cured by theſe laſt Remedies. As to the Firſt, which are intended only to be ſubſervient to the Remedies, they are call'd *Retentive*, and are very common in Reſpect to other Bandages; but do not contribute to the Cure in any other Way than by keeping the Remedy upon the affected Part. Among theſe, there are very many which are adapted only to ſome certain Parts, as for Inſtance, to the Throat, the Belly, which cannot be bound up by any other Bandages.

The Materials of the Bandages being thus ordered according to the before-mentioned Conditions, all the reſt depends on the Management of the Chirurgeon, who being acquainted with the different Sorts of the Bandages, and the Caſes unto which they are to be applied, has no more to do than to apply and take off the Bandages with Dexterity.

If you intend to apply your Bandages as you ought to do, you muſt obſerve the following Circumſtances and Directions: Firſt of all put your Patient in a convenient Poſition; which done, let One or Two of the Aſſiſtants of the Chirurgeon take hold of the Part unto which the Bandage is to be applied. Let the Band be roll'd ſtreight together with equal Circuits, and covered all one upon the other like the concentric Rings. Then take hold of it with one Hand, and of the Chief with the other, and apply it without the leaſt Heſitation, without which you would give ſome Suſpicion to the Aſſiſtants, as if you were dubious unto what Part to make your Application. From that Moment you muſt, with as much Exactneſs as Diligence, make your Circumvolutions of the Band round the affected Part; and to take Care not to let the Patient lie any longer in Languiſhment than of Neceſſity he muſt. The Bandage being applied in due Manner, he muſt ſtrictly

mine whether the Circumvolutions are made equal, and well ſettled, and whether they are not either too looſe or too ſtreight, and whether they be exactly fitted to the Shape and Bulk of the Part; which after this muſt be laid upon a Cuſhion, to keep it ſteady, and free from Pain; taking this for a general Rule, That the Arm muſt be always kept in a ſomewhat bended Poſture, and the Leg extended at its full Length.

The Dexterity of a Chirurgeon is no leſs conſpicuous in taking off the Bandages without Trouble and Confuſion, than in applying them.

When therefore you are to take off the Bandages, you muſt put your Patient into the ſame Poſition as you did before when you put them upon the affected Part, which muſt be kept or held ſteady by one of the Aſſiſtants. After this you muſt take off gently and neatly the Bands, ſo as to roll them off ſometimes with one and ſometimes with the other Hand, and to take Care not to let them ſlip out of your Hands, and to cauſe as little Pain as poſſibly may be to the Patient. If the *Bands* happen to ſtick to one another, or to the affected Part, you muſt, in order to looſen them with the leſs Trouble, moiſten them with ſome liquid Matter, which muſt be changed according to the Condition of the affected Part; as for Inſtance, when there is abundance of Pain, you may make Uſe of Oil; when there is a Coldneſs and Weakneſs in the Part, of Wine; and of *Oxycrate* when there is an Appearance of an Inflammation.

Let us now proceed to a particular Examination of the Bandages, which are repreſented in the Figure, and are mark'd with the Letters *A*, *B*, *C*, *&c.* being ſuch as are moſt frequently uſed, and conſequently of Neceſſity to be known to a Chirurgeon.

A. The Firſt among theſe Bandages is call'd the *Couvrechef* (in *French*) ſo call'd, becauſe it covers and ſurrounds the whole Head. It is made of a Napkin, doubled together in Two, to be applied to the Head; and of the Four Corners, which hang down on the Sides of the Face, Two are tied together under the Skin, and the other Two under the Nape of the Neck. This Bandage is more frequently uſed than any of the reſt, being adapted to all the Wounds of the Head.

B. The Second is call'd the *Bandeau*, and is diſtinguiſh'd into Two Sorts, to wit, the *Simple*, which is made with a Band, turn'd in a circular Form round the Head; and the *Figured*, which is made up of ſeveral Pieces of Linen doubled and ſew'd together. It has Four Strings at its Four Corners, wherewith to tie it together on the back Part of the Head. This Bandage is particularly adapted to the Forehead.

C. The Third is call'd the *Scapulary*, ſo call'd, becauſe it lies upon the Shoulders. It is made of a Piece of Linen of about Two or Three Foot long, and about Seven or Eight Inches broad. It is ſplit or cut aſunder in its Middle lengthways, to put the Head through it, and ſerves for a Support to all the *Bandages* that are applied to the Breaſt and the Belly. One of theſe, mark'd with *C.* is repreſented in the ſame Manner as it is uſed to be applied to the Body, and the other is ſhewn apart.

D. The Fourth is nothing elſe but a Napkin, which muſt be of ſuch a Length, as to reach quite round the Body. You muſt lay it Three or Four-doubled together, and thus make a Band of it for the Wounds of the Breaſt and the Belly; for before and behind you faſten it to the Extremities of the *Scapulary*, which prevents its ſlipping downwards.

E, F, G. The Fifth, mark'd with *E, F, G.* is a Band uſed in Phlebotomy, or letting of Blood. Its Length is of about an Ell, and its Breadth Two Inches. That marked with *E* repreſents the Band before it is uſed. That with *F* ſhews an Arm, unto which it has been applied, after the Phlebotomy; and that mark'd with *G* repreſents the Manner of applying this Bandage in the Phlebotomy of the Foot, call'd the *Stirrop*. I ſhall have Occaſion to ſpeak more at large of theſe Two Bandages hereafter.

H, I. The Sixth is a Bandage adapted to the Arm, or the Leg, call'd the *Rampant*. It is made by a *Band* roll'd together upon one of its *Chiefs* or Heads. Its Length is about Two Ells, and its Breadth of about Two or Three Inches. When this Bandage is to be applied to the Arm, you muſt begin with Two circular Turns round the Wriſt, and ſo

continue it upwards to the Shoulder, leaving a Space betwixt each of its Circumvolutions.

When you are to apply it to the Foot, you muſt begin with making a Stirrop, *i. e.* to let the Firſt Chief paſs underneath the Sole of the Foot, and then continue to go with your Band upwards, as before in the Arm, to the Calf of the Leg. This Bandage is only *contentive*, becauſe it ſerves for no other End than to contain or keep the Remedies upon the affected Part. That mark'd with *H* repreſents this Bandage applied to the Arm; and *I* ſhews the Band before it is applied.

L. The Seventh is the ſimpleſt of all, being made of a ſmall and ſhort Band. It is no longer than is ſufficient for Two or Three circular Turns, without riſing or deſcending upwards or downwards.

M. The Eighth is alſo a ſimple *contentive* Bandage, but requires a much larger Piece of Linen than the former. Sometimes it is tied together by ſmall Strings, and ſometimes it is ſewed together upon the affected Part.

N. The Ninth is a Bandage adapted for the Leg, when we deſign to make a very ſtrong and firm Bandage. It is made with a Band, like unto that which is call'd the *Rampant*. You muſt convey its Firſt *Chief* underneath the Sole of the Foot, and then you bring it up again on the other Side croſsways the *Tarſus*, ſo as to make a Croſs of St. *Andrew*: After you muſt continue your Circumvolutions to the Top of the Calf of the Leg. It is further obſervable, that in that Part where the Leg begins to riſe, you muſt turn your Band both Ways, and continue thus till you come to the very thickeſt Part of the Calf of the Leg, for elſe the Bandage would be apt to ſlip, and not ſtick cloſe to the Leg as it ought to do.

O. The Tenth is a *Band* roll'd up with both its *Chiefs* or Heads. It is commonly applied in its middle Part, ſo as to hold both its Chiefs, one in each Hand. This Band is made either longer or ſhorter, according to the different Proportion of the Party and the Condition of the Diſtemper. Theſe *Bands* ſerve to make the *Bandages* call'd the *Capeline* and the *Spica*, which are often uſed.

P. The Eleventh is a ſmall *Band* not above Two Inches broad, and no longer than juſt to make Two Turns round the affected Part. It is ſplit in Two near one of its Extremities, in order to paſs the other *Chief* through the Hole. This is call'd the *Incarnative*, or the *Uniting Bandage*, becauſe it ſerves to reunite the Lips of a Wound that is made lengthways, to ſave by this Means the Trouble of a Suture, or its ſticking together. You muſt begin to apply it at the Middle of the Band, at the oppoſite Part of the Wound: As for Inſtance; if you are to apply it to the Forehead, for which it is deſigned in a particular Manner, you muſt apply the middle Part of the *Band* to the *Occiput*, and then letting the Two *Chiefs* paſs on both Sides above the Ears, you muſt ſecure or draw one of them through the Hole of the other on the right Side of the Wound; then draw them both at once together, by which Means you will rejoin the Two Edges of the Wound ſo exactly to one another, that they will reunite without leaving any Deformity behind them.

Q. The Twelfth is a Bandage with Four *Chiefs*. It is made with a Band of Linen Cloth, the Two Extremities of which are ſplit or cut aſunder lengthways. If they are ſplit in Three, 'tis a Bandage with Six Chiefs, and if each of them is cut in Four, 'tis a Bandage of Eight Chiefs, and is adapted to ſeveral Parrs. We judge it to belong chiefly to the *incarnative* or *uniting Bandages*, becauſe we make Uſe of it for the Drawing together and Reunion of the Lips of a Woundthat is made croſswiſe a certain Part of the Body. By the Help of theſe Two laſt *Bandages* a Chirurgeon may often avoid coming to the Sutures, or ſtitching up of the Wounds; from which a wounded Perſon ought to be exempted as much as poſſibly may be done, it being much more natural and eaſie to ſubmit in ſuch-like Caſes to the obtuſe Senſation of a *Bandage*, than to the acute Pains of a Suture.

R. The laſt among theſe Bandages is what they call a *figured Bandage*, repreſenting the Letter T. It is call'd figur'd becauſe it is made of Two *Bands* ſew'd together. Some of them are call'd *ſimple*, ſuch is that which is repreſented here; and others are doubled, and ſplit or cut aſunder, and are made Uſe of upon many Occaſions. Theſe

Bandages

Bandages are adapted to divers Parts of the Body, but more eſpecially after the Operation of Lithotomy, and the *Fiſtula in Ano*.

If I were in this Place to enter upon a particular Account of the Bandages, it would require a much longer Time than what is allotted us upon this Occaſion: Wherefore we will now proceed to the Sutures.

Of the SUTURES.

THE *Suture* is a Chirurgical Operation, which by the Help of a Needle and Thread is aſſiſtant in rejoining and reuniting into a perfect Continuity thoſe Parts of our Body which have been ſeparated by ſome Violence, and are as yet bloody.

The Word *Suture* is taken in a double Signification, to wit, either for the mutual Union of the Bones of the Skull, which are indentated one with another in the Nature of the Teeth in a Saw, or elſe for a Sewing or Stitching together of the Wounds, when Occaſion requires. In the laſt of theſe Two Significations we take it here, when we ſay, that the Suture is the beſt Means we ought to make Uſe of to reunite the Wounds which are very lately made, and that in ſuch Caſes where this End is not to be attained to by Bandages; for the Lips of the Wound being drawn together by the Help of the Needle and Thread, the Extremities of the principal Fibres, which were cut or torn aſunder, are by this Means rejoin'd and placed cloſe to one another, in the ſame Poſition they were in before they ſuffered a Separation or Diſruption.

The Ancients have invented many Sutures, which they have reduced to Three Sorts, to wit, the *Incarnative*, the *Reſtrictive*, and the *Reſerving* Sutures.

The *Incarnative* has obtained its Denomination, becauſe by its rejoining the Edges of a Wound, and keeping them cloſe together, by the Help of the Needle and Thread, which draws them near to one another, it produces their Reunion and Incarnation, in the ſame Condition as they were before.

It is ſubdivided into Five other *Sutures*, to wit, the *Entrecoupee*, the *Entortillee*, the *Enchevillee* or *Emplumee*, the *Suture* with *Agraphes*, and the *dry Suture*.

Of theſe Five Sutures we will cut off Two, as being not only very cruel, but alſo quite uſeleſs, to wit, the Suture *Enchevillee* or *Emplumee*, *i. e.* the Feather'd, and the Suture with *Agraphes*, or with Claſps; for in thoſe very Caſes where they ſeem to be moſt neceſſary, to wit, in very deep Wounds, where the Contraction of the carneous Parts which are cut aſunder keeps the Edges at a good Diſtance aſunder; and in the Wounds of the Tendons they would expoſe the Patient to moſt terrible Convulſions, and other dangerous Accidents, which are avoided by endeavouring as much as poſſibly may be the Dilatation of theſe Wounds by moderate Compreſſions, and attending with Patience the Relaxation and Prolongation of the Fibres, for their mutual Reunion. I will therefore not ſay any more of theſe Two, but content my ſelf with giving you an Account anon of the other Three, to wit, the Sutures *Entrecoupee*, *Entortillee*, and the *dry Suture*.

They had given the Name of a reſtrictive or adſtringent Suture to that Kind, by the Help of which they pretended to ſtop the Flux of the Blood in thoſe large Wounds where ſome of the conſiderable Veſſels were wounded; to obtain which End they had invented divers Ways of ſtitching together, as thoſe made Uſe of by the Shoemakers, by the Furriers, *&c.* but all of them quite uſeleſs: For if we reflect but never ſo little upon theſe Sutures, we muſt of Neceſſity condemn them; for ſuppoſing it were poſſible to ſtitch or ſew the Skin ſo exactly together, that no Blood could penetrate it, this does not prevent it from iſſuing out of the Apertures of the wounded Veſſels, and from falling into all the Interſtices of the Muſcles, where of Neceſſity it muſt cauſe Tumours, Suppurations, and laſt of all a Gangrene: So that it is not without very good Reaſon that we reject this Suture; the more, becauſe we are not deſtituſtute of other Means to ſtop the Flux of

the Blood; which as they are much more ſecure, ſo they are much leſs painful.

The *Preſerving Suture* was call'd that Kind of Suture among the Ancients, by which they pretended to prevent the Lips or Edges of the Wounds, from keeping at too great a Diſtance from one another in the great Wounds, where there was a Loſs of Subſtance: But as this Intention may be obtained by the Application of proper Bandages, 'tis in vain to pretend to perform it by the Help of long Threads, to be drawn acroſs the Wound, which will ſerve only to encreaſe the Trouble in the Dreſſing of the Wound, and irritate its Fibres without Intermiſſion, till theſe Threads are either cut or broken aſunder; wherefore I reject it as well as the *reſtringent Suture.*

And this I do not altogether upon my own Authority: The ſmall Benefit that has been reap'd by the Uſe of them, and the pernicious Accidents which have been occaſion'd by them, have been ſufficient Motives to moſt of our modern Chirurgeons to reject them for ever: For during my Practice of Chirurgery for theſe Thirty Years laſt paſt, I never practiſed it, nor never ſaw it uſed by ſo much as one ſingle Chirurgeon; and of Four hundred Chirurgeons that are here preſent, I believe there is ſcarce any one that has put it in Practice.

The only Advantage that is propoſed by the Sutures is the Reunion: Two Things concur to accompliſh it, to wit, the Chirurgeon and Nature. On the *Chirurgeon's* Side Two Circumſtances are abſolutely neceſſary and worthy your Obſervation: The *Firſt* is, to bring the Lips of a Wound cloſe to one another; and the *Second*, to keep them in that Poſition. On *Nature's* Side, 'tis ſhe that by her natural Balſam, as by the moſt proper Cement, cloſes and reunites theſe Lips one with another.

Be not ſurprized that I put the Chirurgeon before Nature, becauſe Nature would work in vain upon a Wound, were it not that the Chirurgeon, by his Induſtry and Application, did put the Parts in a Condition of Reunion, by the Motion and Juices which Nature furniſhes them withal.

To frame to your ſelf the better an Idea of the Manner of this Reunion, you muſt obſerve, That all the Parts of our Body are compoſed of nothing eſſe but of certain Canals or Pipes, through which are diſperſed and moved without Intermiſſion, ſome liquid Juices, which are always endeavouring to expand themſelves on all Sides, and which are always puſh'd forward into a circular Motion from one Part into another.

So that ſo ſoon as the Chirurgeon has brought the Lips of a Wound together, by the Means of a Suture or of a Bandage, and keeps them in that Poſition, theſe Juices, which endeavour to paſs and repaſs from one Lip into another, finding the Conduits or Pipes broken, do extravaſate, and their moſt glutinous and balſamick Particles ſtopping in the Intervals, that will always remain betwixt the Lips of a Wound, though never ſo well kept together, are congealed and hardened there by the Heat of the Part; ſo that being fixed to the Two Walls of the Wound, they keep it united in ſuch a Manner, that the Extremities of the Filaments and Capillary Veſſels, make up in a little Time an entire Continuity of the ſame Contexture as it was before their Diſunion.

'Tis in the tranſverſal Wounds that we ſtand in Need of a Suture, and more particularly in thoſe which cannot be reunited by Means of a Bandage; for when there is any Room for Bandages, ſuch as are the *incarnative* and *uniting* Bandages, which are capable of bringing the Lips of a Wound immediately together, you muſt ſave your Patient the Trouble of all other Means to effect it.

Wounds which are much torn, or Pieces of Fleſh hanging down, Pieces of a Noſe or Ear half cut off, do alſo require a Suture; but it is an Abuſe to pretend to apply it to thoſe Parts, ſuch as the Noſe or Ear, when they are entirely ſeparated from the Whole; though there are ſome Authors that pretend to maintain the contrary. 'Tis a great Piece of Folly to imagine, that 'tis poſſible to reſtore a Noſe that is taken or cut away, by applying in its Place a Piece of Fleſh of the Thigh or Arm, ſhaped like a Noſe, as ſome do pretend to have done with good Succeſs.

Though the Sutures are an infallible Means to rejoin a Wound together, and to procure its Reunion, there are nevertheleſs certain Caſes wherein they muſt be forborn:

Of

Of theſe there are Six or Seven wherein they cannot take Place: *Firſt*, in thoſe Wounds which are ſuſpected to be poiſoned, becauſe it is requiſite to give Vent to the Poiſon, and to convey the Remedies to their moſt interior Parts, whether the Poiſon has penetrated. *Secondly*, in the Wounds of the Breaſt, by reaſon of its continual Motion. *Thirdly*, in thoſe that are attended with violent Inflammations, becauſe the pricking of the Needle would ſerve only to encreaſe them. *Fourthly*, in the Wounds attended with great Contuſions, becauſe the Fleſh is not firm enough to bear the Thread. *Fifthly*, in thoſe Wounds where there is an Aperture of ſome large Veſſels; for theſe muſt be treated with proper Ligatures and Adſtringents. *Sixthly*, in thoſe Wounds where the Bones are laid open, by reaſon of the Exfoliation which muſt be expected to follow. *Laſtly*, in thoſe Wounds where there is a conſiderable Loſs of the Subſtance, becauſe here we muſt give Room for the Coming out of the Matter to regenerate the Fleſh.

When you meet with a Wound that has none of theſe juſt now mentioned Qualifications belonging to it, and that you are convinced that there is a Neceſſity of making a Suture, you muſt, before you proceed to this Operation, beſides your ordinary Chirurgical Furniture, be provided with Three Things, that are abſolutely neceſſary to this Purpoſe, *viz.* a Needle, mark'd with *A.* a Thread, with *B.* and a Pipe, with *C.* You muſt chooſe ſuch a Needle as is adapted to the Nature of the Wound; for you muſt be provided with Needles of different Figures and Sizes for ſuch-like Operations; for ſome of them are ſtreight, others leſs or more incurvated: But theſe laſt are to be preferred before the others, becauſe there is not any Part of our Body where they may not be ſerviceable, and that with more Conveniency than the ſtreight Needles. The Metal muſt be firm, for fear it ſhould bend, and the Needle very ſmooth, well poliſh'd, and pointed, that it may pierce the quicker, and that as it paſſes through the Wound, it does not tear it.

The Head of the Needle muſt have a Hole or Eye, through which you draw the Thread, and muſt be hollow on the Sides in the Nature of a ſmall Gutter; ſo that the Thread being lodged in this ſmall Gutter, does not ſtop the Needle, nor hinder its paſſing through the Fleſh with Eaſe, by reaſon of its Bulk at the Head of the Needle. This Thread ought to be very firm, round, even, ſoft, and of a convenient Thickneſs, as well as the Needle. The beſt Sort of Thread of *Florence*, or ſuch-like, is to be preferred before thoſe made of Silk, which are apt to cut the Fleſh, eſpecially if they are died, becauſe the Colours wherewith they are died are cauſtick and corroding. We make Uſe either of a ſingle or a double Thread, according to the Strength it is to bear; and you muſt not forget to draw it through ſome Wax, which makes it keep the better, for elſe it would ſoon be rotten.

The *Pipe* muſt be of Silver, and rather incurvated than ſtreight, to make it the more ſerviceable for all the Parts of the Body. It muſt have a Hole, to give Paſſage to the Needle, and ſplit at it Extremity, to give Egreſs to the Thread. Some are of Opinion, That the Chirurgeon may more conveniently hold the Edge of the Wound whilſt it is ſtitching up, with his Fingers, than with a Pipe: And in Effect, there are certain Caſes where the Suture may be very well made without it; but there are ſome others where you muſt make Uſe of it. The Pipe mark'd with *C* ſhews you how it muſt be ſhaped.

There are Six or Seven general Rules that muſt be obſerved in all the Sutures.

The *Firſt* is, to cleanſe the Wound very well of all the congealed Blood, and any other extraneous Body. The *Second* is, to let the Lips of the Wound be joined together by a Servant, who muſt keep them all the while during the Operation. The *Third* is, not to take Hold of too much of the Skin lengthways, whilſt you are piercing through it obliquely. The *Fourth* is, not to penetrate too deep into the Fleſh, or at leaſt no deeper than is neceſſary, ſo as not to leave a Space at the Bottom of the Wound, where there may be a Collection of Humours, which may go into a Putrefaction. The *Fifth* is, to make your Entrances or Prickings of the Needle at a moderate Diſtance one from the other. The *Sixth* is, to be very careful not to prick a Nerve,

Nerve, a Membrane, or a Tendon. And the *Seventh* is, to put ſometimes a Tent in the lowermoſt Part of the Wounds.

The Suture call'd the *Entrecoupee*, or the *Entrepointee*, or the Interſtich'd, has obtained its Denomination, becauſe after every pricking with the Needle you cut off the Thread, after having faſten'd it with a Ktot. It is uſed in Two different Ways, to wit, either with a ſingle or with a doub'e Thread.

When you are to make Uſe of the Firſt, you muſt take your threaded Needle in the Right Hand, and the Pipe in the Left. Some adviſe you to put the Point of it into Oil, that it may enter with the leſs Difficulty and Pain; and whilſt you are ſuſtaining the ſuperior Lip of the Wound with the Pipe, puſh the Needle in from the Outſide inwards, and when it is paſſed in halfways into the Hole of the Pipe, draw it quite through; then perform your Operation in the ſame Manner at the inferior Lip, but ſo as to draw the ſame Thread from the Inſide outwards.

If the Wound requires more than one Stitch, you muſt make as many of them as are neceſſary, and afterwards faſten every Stitch with the Needle ſeparately; but take care not to make your Knot directly upon the Wound, but on its ſuperior Part. Your Knot muſt be a Chirurgeon's Knot, *i.e.* you muſt draw the Thread twice through the ſame Knot, becauſe it is much firmer, and holds better than a ſimple Knot. Some Chirurgeons lay ſome very ſmall Compreſſes (mark'd with *D*, *D.*) under each of theſe Knots.

The Second Sort of the Suture, call'd the *Entrecoupee*, is made with a double Thread, drawn thro' the Needle. It makes a double Knot at its End; and when you have drawn it through the Wound in the ſame Manner as you did in the preceding Operation, the Knot that is at the lower Part of the ſaid Wound, is drawn up towards the ſuperior, and you draw one of the Threads through that Knot, which done, you faſten it with a double Knot, and cut it off with the Siſſars, mark'd with *E*.

This Suture does not only differ from the preceding in the ſingle and double Thread, but alſo in this Point, that this muſt be begun at the inferior Lip of the Wound, which is the Place where the Thread is to have its Knot. It has alſo this Advantage before the other, that it is much better adapted to deep Wounds, becauſe it is much ſtronger, and draws the Wound much cloſer together.

A Chirurgeon that propoſes to perform the Sutures with all due Exactneſs, muſt be provided with a Pin-Cuſhion well ſtock'd with Needles of all Sorts, ſtreight, incurvated, ſmall and great, round, flat, and triangular, and with Thread alſo of divers Sorts, that ſo he may have at Hand ſuch a one as he judges moſt proper for the Wound he is to ſtitch up: Without this Precaution he will either ſometimes be obliged to make Uſe of a Needle which is not altogether ſo well adapted to his preſent Intention, or elſe he will be forced to ſtay till he can find out or ſend for another that may be better for his Turn.

After the Suture is made, there are ſtill ſome eſſential Points and Circumſtances remaining, which muſt not be neglected by a Chirurgeon.

The chief among theſe is, That after you have taken effectual Care to rejoin the Lips of a Wound together as exactly as it was poſſible to be done, you muſt be no leſs careful to keep it in the ſame Poſition. Some adviſe in this Caſe to apply to the Wound a Powder, which they call the *Preſervative* of the Sutures, being a Compoſition of ſome glutinous Ingredients, ſuch as the *Maſtich*, *Myrrhe*, *Bolus*, and *Aloes*: This is kept in the Viol mark'd with *G*. Others are of Opinion, that the nutritious Juice is the beſt conglutinating Remedy, which being carried to the Part, produces its Reunion or Coalition. They make Uſe moſt commonly of the Balſam of *Arcæus*, (which is contained in the little Pot, *H.*) into which you muſt dip the Pledget, (mark'd with *I.*) which is laid upon the Suture, and is covered again with the other Pledget, (mark'd with *K.*) which is of a ſufficient Bigneſs to cover the Knots, to prevent the Plaiſter from ſticking to theſe Knots, which would prove the Occaſion of freſh Pain when you take off the Dreſſing. Over theſe you put the Emplaſter, (mark'd with *K.*) which muſt be a Compoſition of agglutinative and adſtringent Ingredients, ſuch as

the *Emplaſtrum ad Hernias.* Laſt of all you muſt alſo not forget the Compreſs, (mark'd with *M.*) which you muſt dip into ſome Liquor, which may ſtrengthen the Part, and reſiſt Putrefaction.

As to what concerns the Bandage, you muſt adapt it to the Figure of the wounded Part; and therefore 'tis in vain to pretend to give you any particular Direction upon this Head: I will only ſay thus much, that it muſt be contrived in ſuch a Manner, as to keep the Lips of the Wound cloſe together.

The Suture call'd the *Entortillee*, or *Enfilee*, or the Twiſted, has obtain'd its Denomination from thence, that in this operation we leave the Needles in the Wound, and turn the Thread quite round theſe Needdles, juſt as the Taylors do when they wind the Thread round thoſe Needles they ſtick upon their Sleeves. This Suture is made alſo Two ſeveral Ways, for the Needles are either drawn acroſs the Wound, as thoſe mark'd with *N.* or elſe they are fix'd on the Sides, as thoſe mark'd with *O.*

Either of theſe Operations is made by the Help of Two Needles. In the Firſt you take Two ſtreight and well-pointed Needles, and let them paſs one after another, by the Aſſiſtance of the Pipe, acroſs the Wound. you muſt begin with ſtitching it from the Outſide inwards, and then let it go from the Inſide outwards; ſo that being diſpoſed in ſuch a Manner, as that their Four Extremities make an even Square, you take a Thread, and wind it under their Four Extremities, and then draw it croſsways the Wound Three or Four Times, and thus draw the Lips of the Wound cloſe together. This done, cut off the Points of your Needles with a Pair of Inciſion-Siſſars, and conclude the Operation with laying Two ſmall Compreſſes, (mark'd with *P*, *P.*) under the Needles.

The Second Kind of this Suture, call'd the *Entortillee*, differs only from the preceding in this, that the Needles, inſtead of going acroſs the Wound, are fix'd lengthways in the Lips of the Wound, as you ſee them repreſented in the Figure.

'Tis not to be denied, but that theſe Two Needles muſt be conſidered as *extraneous* Bodies, which continue to wound the Part without Intermiſſion; but if they are well fix'd acroſs the Wound, they will occaſion no further Trouble or ill Conſequence, becauſe in this Diſpoſition they will cauſe but very little Pain, and they cloſe up a Wound without leaving any Thing within that may prove vexatious to it. Theſe Sutures are of moſt admirable Uſe for thoſe Parts which cannot be hinder'd from moving, as the Lips.

The *dry Suture* is ſo call'd, becauſe it is made without Bloodſhed, and without a Needle, Thread, or Pipe, and without any Pain. It is diſtinguiſh'd, like the preceding, into Two Sorts, becauſe ſometimes it is performed with one, ſometimes with Two Pieces of Linen.

In the Firſt of theſe Two Operations you muſt take a ſmall Piece of Linen or Leather, ſhaped in the ſame Manner as you ſee it repreſented, and mark'd with the Letter *Q.* This you muſt cover with ſome glutinous Matter or Medicine that will ſtick cloſe to the Skin; as for Inſtance, Flower mix'd with the White of an Egg: One Half of this you muſt apply to One Side of the Wound, and when you find it ſtick very well there to the Skin, you muſt pull the Linen towards the other Side, and apply the other Half to it till it ſticks very cloſe, and thus keep the Lips together. This Suture is very eaſie, but takes Place only in ſuperficial Wounds.

The Second Sort of the *dry* Suture requires a little more Trouble than the former. You muſt take two ſmall Pieces of Leather, (marked with *R*, *R.*) and cut each of it into a triangular Figure, and upon one of the Sides let it have Three Indentations with a ſmall Thread faſten'd to each of them. This Piece of Leather you muſt cover with ſomething that will make it ſtick cloſe to the Skin; which done, place one upon one of the Lips of the Wound, and the other upon the oppoſite Lip. The Two Places where they are faſten'd muſt be about an Inch's Breadth Diſtance from the Extremity of the Edges of the Wound, in the ſame Manner as you ſee it repreſented in the Figure. This done, you may, by pulling the Threads, draw the Lips of the Wound together, and keep them cloſe, by tying the Threads with a double Knot, and thus accompliſh the Reunion of the Lips. Some Chirurgeons do

ſtitch

ſtitch the Teeth of the Two Pieces of Leather together, and others make Uſe only of Two Pieces of Leather, (mark'd with *S*,) covered with the ſame Remedies, and provided with the ſame Sorts of Strings: But this introduces no real Alteration, and tends to the ſame End.

This Suture is exceeding convenient for the Wounds of the Face, becauſe thereby we avoid the Deformity that is occaſioned by the Stitchings or Prickings of the Needles; ſo that after the Conſolidation of the Wound, there is very little of a Scar to be ſeen.

I will not pretend in this Place to treat of the angular and figured Wounds, becauſe they require ſuch different Ways of ſtitching together, that it is next to an Impoſſibility to give a determinate Account of them all. I will only mention at this Time, that when there are any Angles, you muſt always begin in the Angles with the Suture call'd the *Entrecoupee*; but if they have no Angles, then you muſt begin in the Middle of their Lines, whether they be ſtreight or circular. You muſt make as many Stitches as the Length of them does require, but ſo as to obſerve a reaſonable Diſtance betwixt them, neither too cloſe, nor too wide, according as you find the Wound inclined to open again; but take this for a common Rule, That you always begin to ſtitch up the Wound with the greateſt Force in that Place where you find the Wound moſt apt to dilate it ſelf; for if you keep this Part well united, all the others will remain as it were of their own Accord in the ſame Situation you have put them into before.

After the Wound is healed up, the Chirurgeon is to conſider Two Things, to wit, Firſt, the Time when to remove the Suture; and Secondly, the Manner how to do it. When the Wound is perfectly healed up, then is the Time to remove it; for then nothing remains to be cicatrized, excepting the Holes made by the Needles, which prevent their Conſolidation. And here it is to be obſerved, that the Suture called the *Entrecoupee* muſt be removed one Way, the *Entortillee* another, and the *dry Suture* ſtill another Way.

In the Firſt you muſt convey a ſmall Probe under the Thread, and then cut it aſunder with the Points of the Siſſars upon the Probe near the Knot, and then draw it out by the Knot, ſo as to reſt your Finger upon the Wound, for fear it ſhould open again. In the Second, or the *Entortillee*, you muſt looſen the Thread that is turned round the Needles; which done, you muſt draw out the Needles with the utmoſt Dexterity, and without offering the leaſt Violence, which if you do not be very careful of, the Wound may happen to break out afreſh. If it be a dry Suture, you have no more to do than only to moiſten the Pieces of Linen Cloth or of Leather, that ſtick faſt to the Skin, with fair Water, and when they are once well wetted through, they will eaſily come off of the Wound, without any further Trouble.

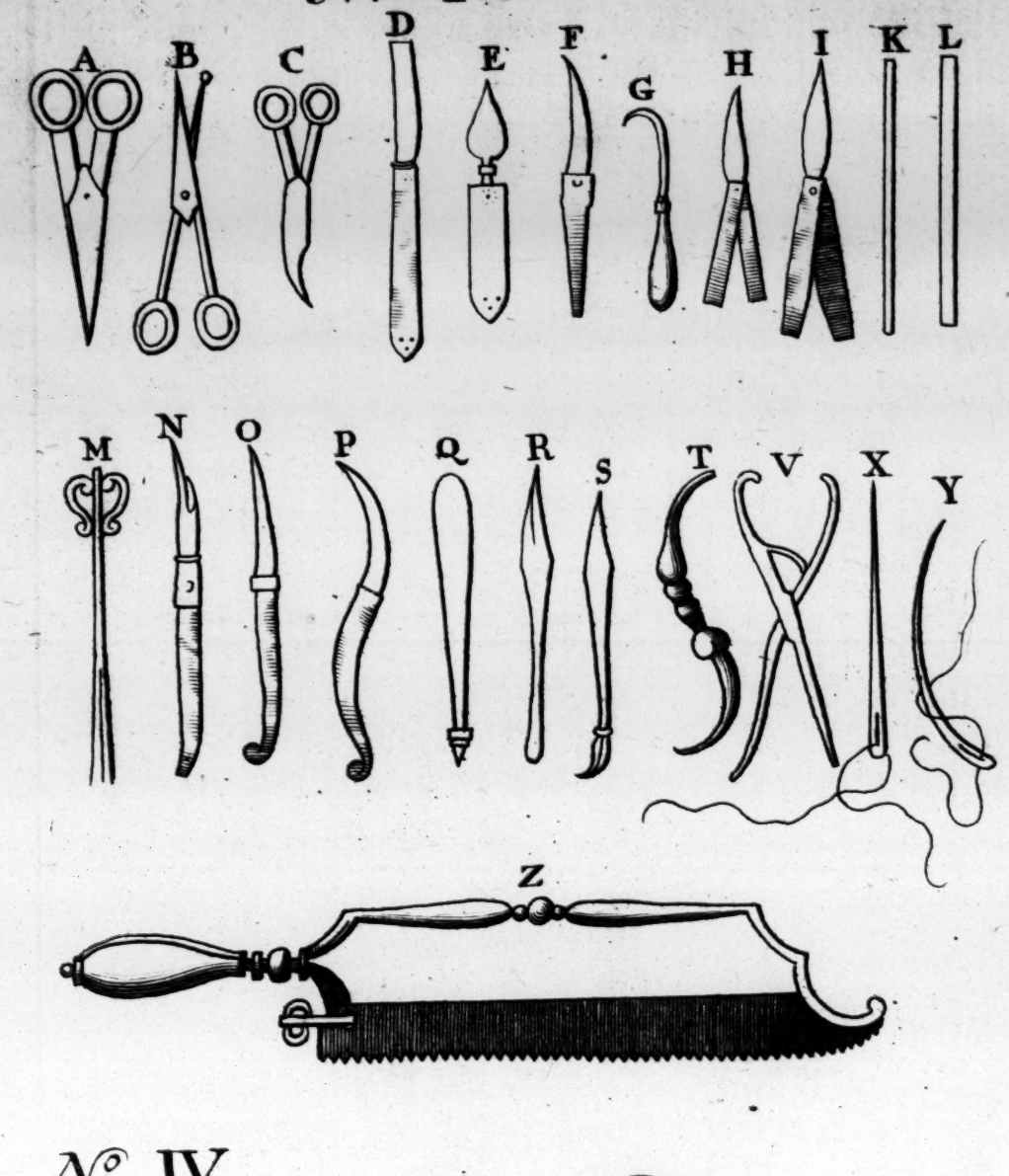
The TABLE, containing an Explanation of the *FIGURES* repreſenting the Chirurgical Inſtruments, Tents, *Canulæ*, Pledgets, Doſſils, Compreſſes, and Bandages, in General.

N° I. *repreſents the Chirurgical Inſtruments in General.*

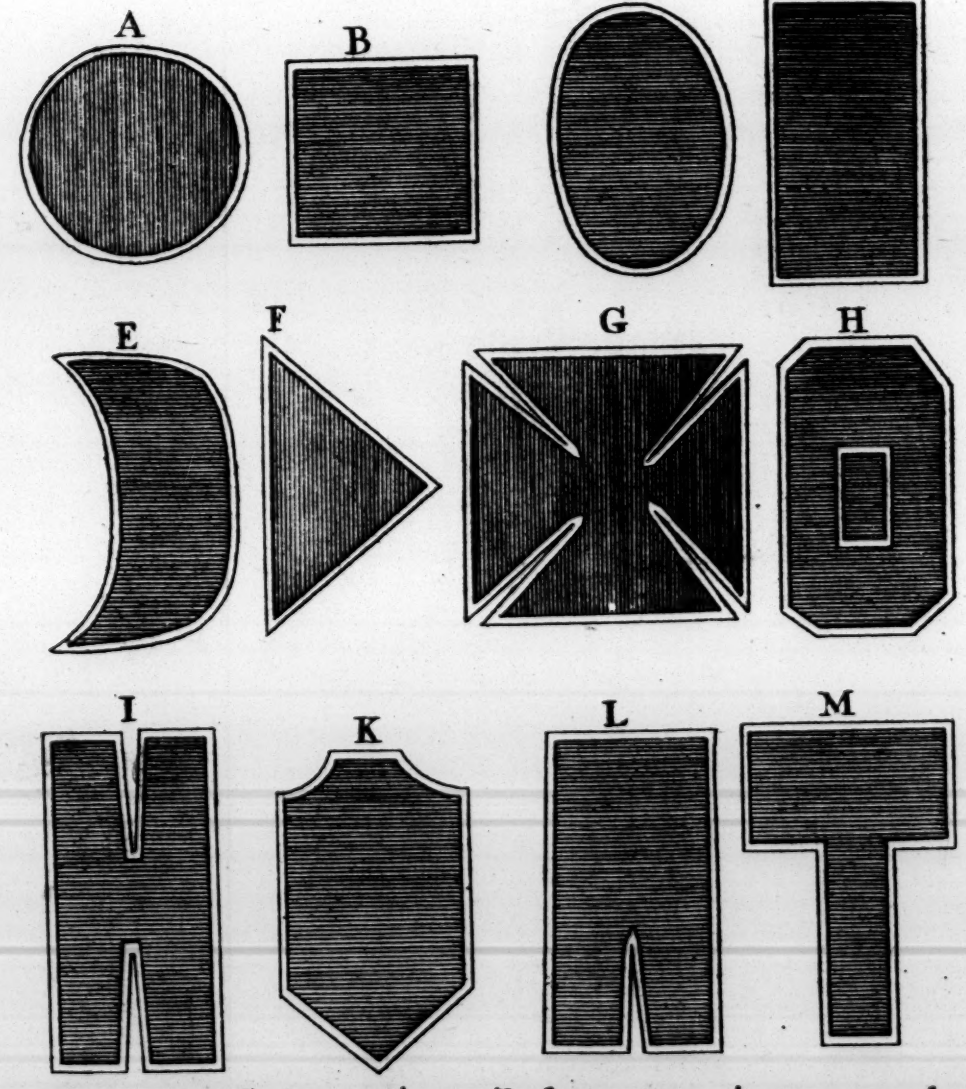
A. Repreſents a large Pair of Siſſars.
B. Another Pair of Chirurgical Siſſars, much leſs and finer than the former.
C. A crooked Pair of Siſſars.
D. A Razor.
E. A Scalpel, or Diſſecting-Kniſe.
F. Another Sort of a Scalpel, with a broad Back.
G. The Inſtrument call'd the *Airigne*, (in *French*) being a Kind of a Hook.
H. The Lancet.
I. A Lancet for Abſceſſes.

K. A

N°. I.

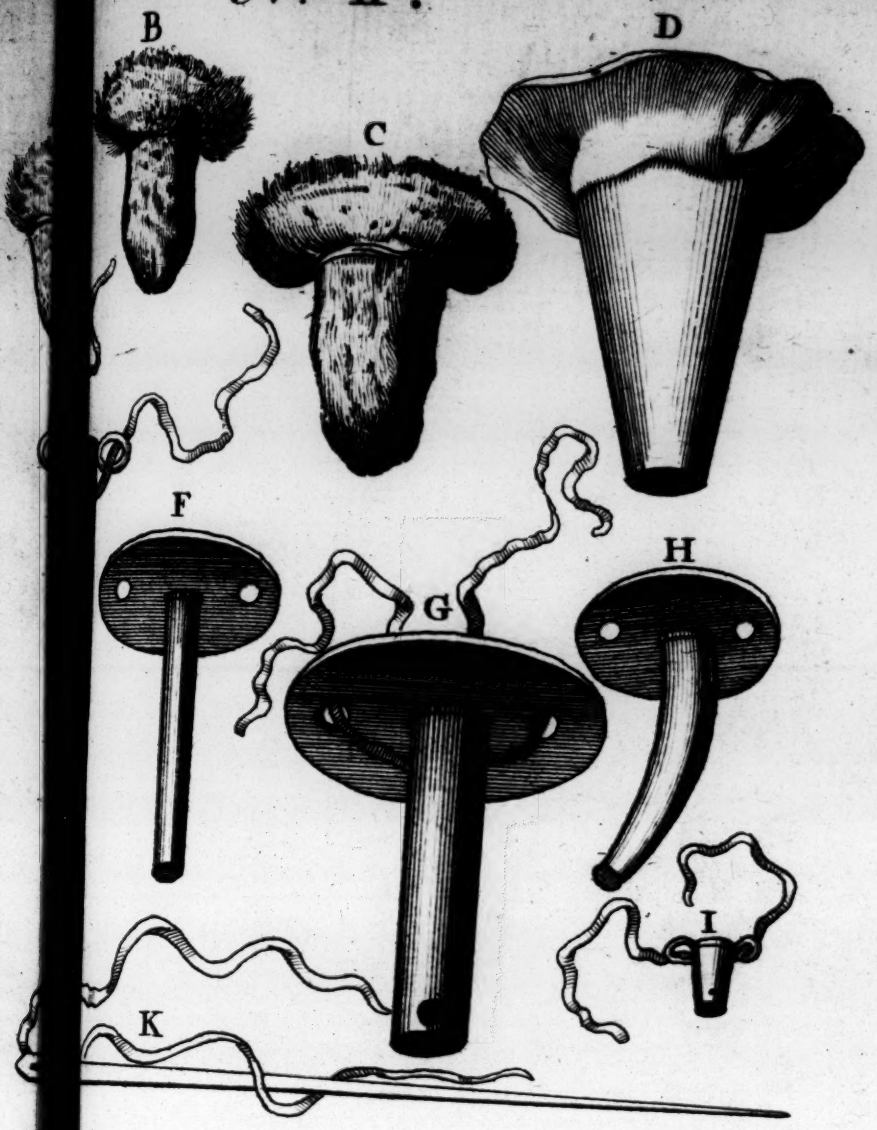


N°. IV.



Chirurgical Instruments in General.

N°. II.



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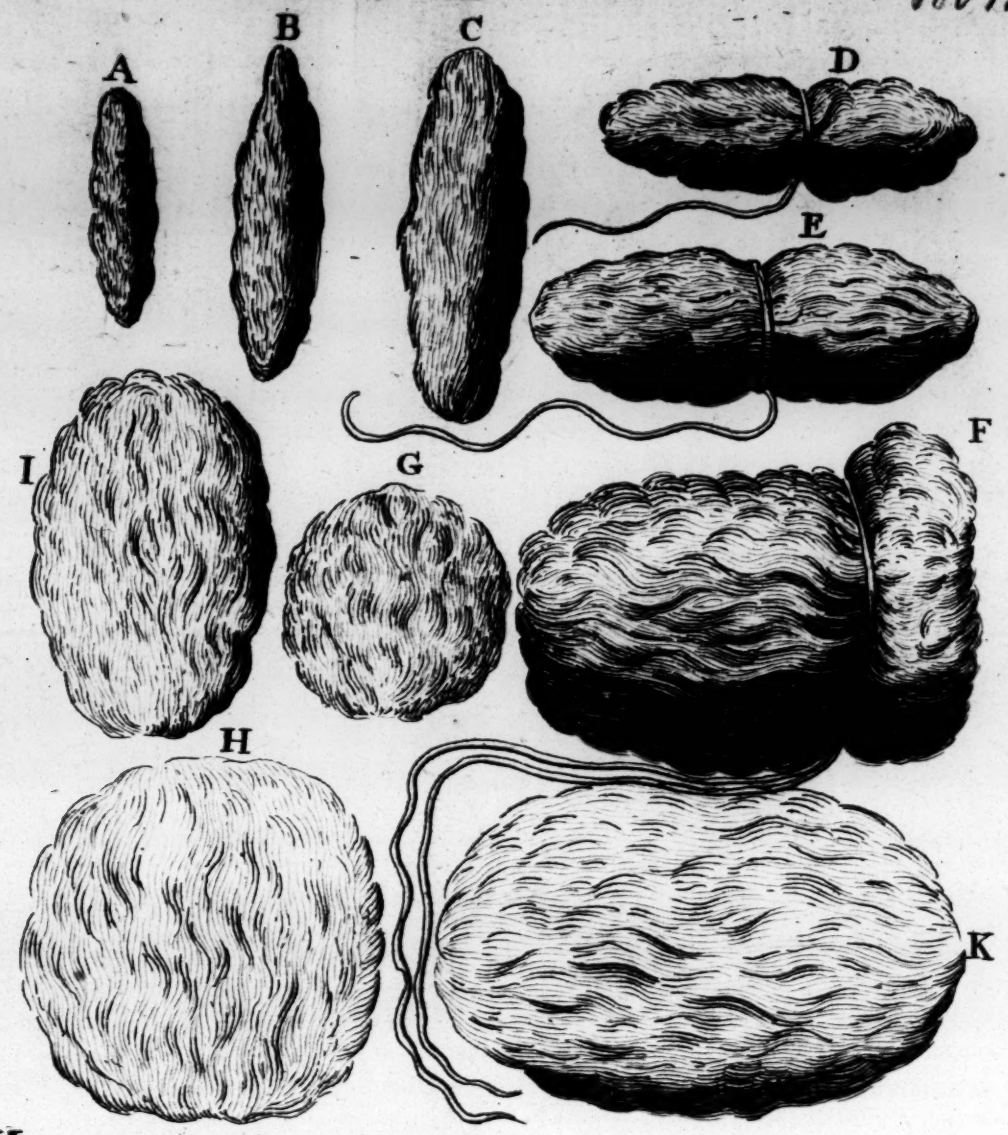

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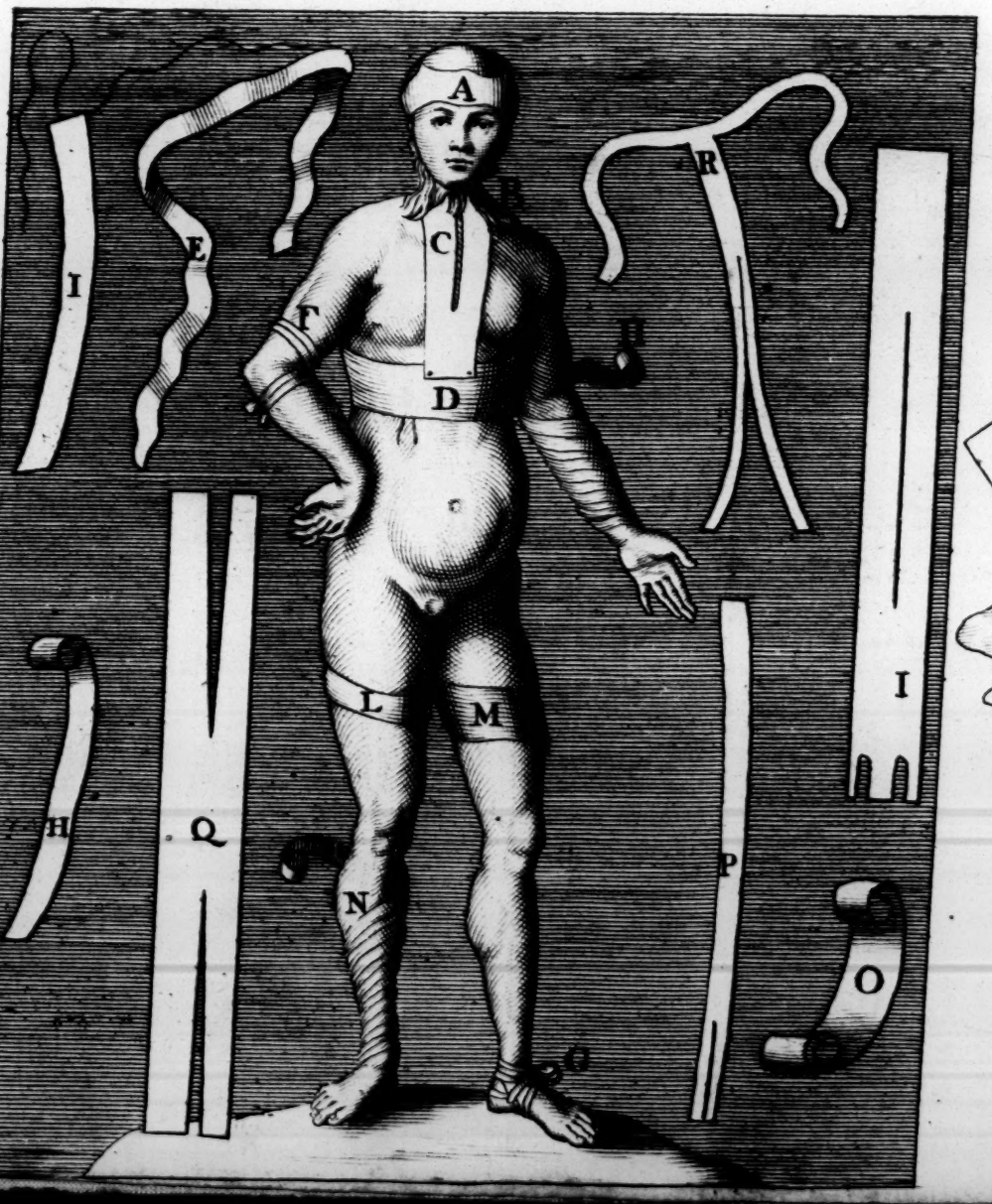
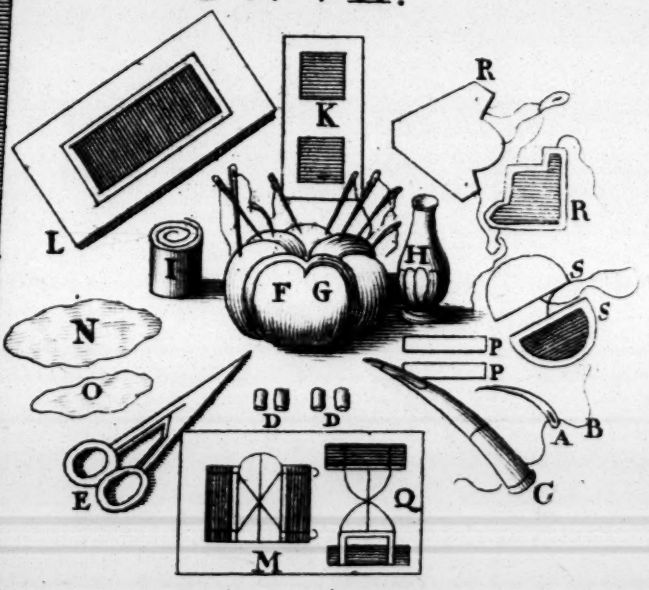
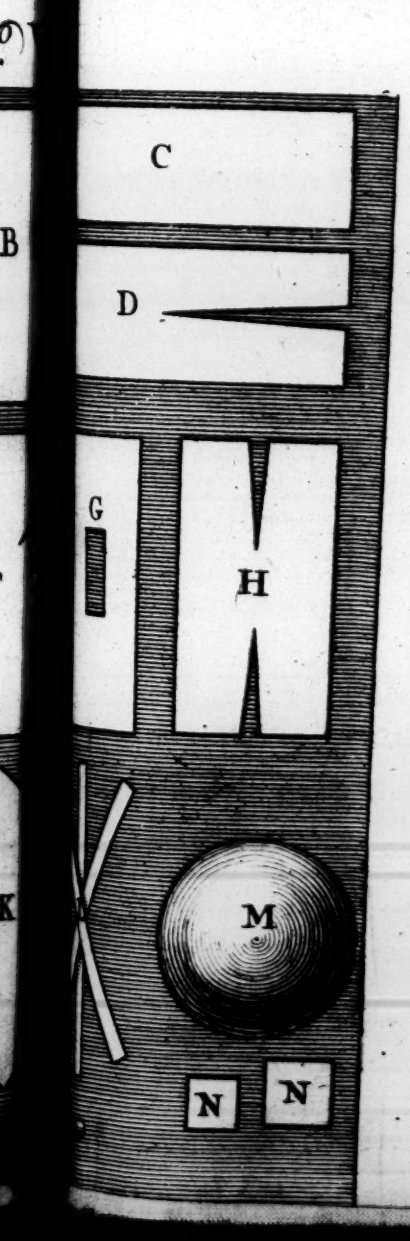


N°. VII.





K. A common Probe.
L. A flat Probe.
M. A Kind of a crooked Probe.
N. A Sort of a Scalping-Knife, call'd the *Biſtoury* in *French*.
O. A ſtreight *Biſtoury*.
P. A crooked *Biſtoury*.
Q. A *Spatula*.
R. A *Demiſpatula*, or the Knife call'd the Mirtle-Leaf, from its Figure.
S. Another Knife call'd the Mirtle-Leaf, being finer and ſmaller than the former.
T. An Elevatory.
V. A Pair of Pincers or Tweezers.
X. A ſtreight Needle.
Y. A crooked Needle.
Z. A Saw, ſuch as is made Uſe of by the Chirurgeons.

N° II. *repreſents the Tents, and* Cannulæ *or hollow Pipes, and the Seton.*

A. A ſmall Tent made of twiſted Lint.
B. Another Tent of Lint, ſomewhat bigger than the former.
C. A very large Tent, made likewiſe of Lint.
D. A Tent made of Linen Cloth.
E. A large *Cannula* or hollow Pipe.
F. A *Cannula* or Pipe with a flat Head.
G. Another flat-headed *Cannula* with an oval or flattiſh Body.
H. A crooked *Cannula* with a flat Head.
I. A very ſmall *Cannula* with Two Rings on its Head.
K. A Seton-Needle.

N° III. *repreſents the Doſſils and Pledgets.*

A. A ſmall Doſſil made of twiſted Lint.
B. Another of a middle Size of the ſame Sort.
C. A Third Doſſil, ſtill larger than the former.
D, E. Two others of the ſame Sort, and of an oval Figure likewiſe, but ſtill larger, and tied with a Thread in the Middle.
F. Is a very large one, with a double Thread tied to its Head, to draw it out of a Wound.
G, H. Are Two Pledgets of a round Figure, the firſt being leſs than the latter.
I, K. Are Two large Pledgets of an oval Figure and flat, to be laid one on the Side of the other in very large Wounds.

N° IV. *repreſents the Emplaſters of different Figures or Shapes.*

A. A round Emplaſter.
B. A Four-ſquare Emplaſter.
C. An Emplaſter of an oval Figure.
D. A longitudinal Emplaſter, for the Fractures in the Arms or Legs.
E. An Emplaſter ſhaped like a Half-Moon, for the *Fiſtula's* in the *Anus*.
F. A triangular Emplaſter.
G. An Emplaſter ſhap'd like a *Maltheſe* Croſs, to be applied to the Stump of a Member after Amputation.
H. The Emplaſter with a Window, *i. e.* with a Hole in its Middle.
I. The trapezial Emplaſter.
K. The Emplaſter ſhaped like a Cuſhion, for making a Bliſtering-Plaiſter betwixt the Shoulders.
L. The Emplaſter call'd the *Ypſiloides*, from its Reſemblance to the *Greek* Letter Υ.
M. The Emplaſter call'd the T. from its Reſemblance to that Letter.

N° V. *repreſents the Compreſſes of different Sorts.*

A. A Four-ſquare Compreſs.
B. A Compreſs call'd the *Splenick*, from its Reſemblance to the Figure of the Spleen.

C. Is a longitudinal Compreſs, when applied lengthways to an Arm or Leg; but is call'd the *Circular* when applied round the Limbs.

D. Is a circular Compreſs, ſlit up to the Middle at one of its Ends.

E. A thick Compreſs, call'd the *Triangular*, from its Figure.

F. A Compreſs ſhaped in Form of a Croſs of *Maltha*, to be applied after Amputations.

G. A Compreſs with a Hole or Aperture in the Middle, uſed chiefly after the Operation of *Bronchotomy*.

H. The trapezial Compreſs, being ſlit at both Ends.

I. A large Four-ſquare Compreſs, ſlit from its Two inferior Corners up to its Middle, uſed in the Luxations of the *Humerus* with the *Omoplata*.

K. A Compreſs call'd the *Lozenge*, from its Figure.

L. The oblique Compreſſes, being Three in Number, Two whereof, which are oblique, do ſtand in Form of a Croſs of St. *Andrew*, and the Third lies vertically acroſs their pointed Angles.

M. Is a round Compreſs like a Globe: Some are alſo of the Figure of a Demi-Globe.

N, N. Are Four-ſquare thick Compreſſes, uſed after Phlebotomy in the Arm or Foot.

O, O. Are Two oblong ſmall Compreſſes, made Uſe of in the Ligatures of the Veſſels, to faſten the Thread upon them.

P, P. Two other very ſmall roll'd Compreſſes made Uſe of in the Sutures, but eſpecially thoſe of the Tendons.

N° VI. *repreſents the ſeveral Bandages.*

A. The Couvrechief or the Kercher, being a Bandage adapted to the Head.

B. The frontal Bandage, with Four Strings at its Four Corners.

C. The Bandage call'd the *Scapulary*, from its being adapted to the Shoulders.

D. A Napkin doubled twice or thrice together, being the Bandage for the Breaſt and Belly.

E, F, G. Bands or Rollers for letting of Blood.

E. Repreſents it before its Application.

F. Shews how it is to be applied to the Arm.

G. Repreſents it when applied after Venæſection in the Foot, and then it is call'd the Stirrop.

H, I. Two contentive Bandages for the Arm or Leg, call'd the *Rampant*.

H. Shews you how it is applied to the Arm.

I. Repreſents it before it is applied to the Part.

L. Is a ſimple Bandage, making only one or two Rounds, without aſcending or deſcending.

M. Is another ſimple or ſingle contentive Bandage, but ſomewhat larger than the former.

N. Repreſents a Bandage for a Leg, when it is to be kept all over firm and ſteady in the Poſition it is put in, made almoſt like the *Rampant*.

O. Is a Band or Roller, roll'd up equally at its Two Heads, its middle Part being to be applied firſt to the Part.

P. An Incarnative or Union Bandage, having a Perforation or Hole at one End, to draw the other Extremity through it.

Q. A Bandage with Four Heads. Sometimes the Band is at each End ſlit into Three Parts, and then it makes a Bandage with Six Heads: Sometimes into Four, and then it has Eight Heads, *&c.* It belongs to the Incarnative and Uniting-Bandages.

R. Repreſents a Bandage ſhaped in the Figure of the Letter T. It belongs to the figured Bandages, as they are call'd, being a Compoſition of Two Bands ſewed together.

N° VII. re-

N° VII. *repreſents the Inſtruments and other Things belonging to the Sutures, or Stitchings.*

A, B. Repreſents a Stitching-Needle threaded with Thread.

C. Is the *Cannula*, or hollow Pipe, a little incurvated.

D, D. Two ſmall Compreſſes, to be laid under the Knots of the Thread.

E. The Siſſars.

F, G. Repreſents a Pin-Cuſhion, garniſh'd with Needles of divers Sorts, ready threaded for the Sutures.

H. A Pot with Balſam.

I. A ſmall Pledget to be laid upon the Suture.

K. A much larger Pledget, to be laid over the former, to cover the Knots of the Thread.

L. An agglutinative and adſtringent Emplaſter.

M. A Compreſs dipp'd in ſome fortifying Liquor.

N, O. Repreſent Two different Ways of making the Sutures through the Wound, *viz.* either by ſtitching croſsways through the Wound, or elſe lengthways along the Sides of it.

P, P. Two ſmall Compreſſes to be laid under the ſtitching-Needles.

Q. Is a Piece of Linen-Cloth, or of Leather, covered with ſome agglutinative Matter or Medicine, to be applied to the Wound, to make a dry Suture.

R, R. Two Pieces of Leather, ſhaped in the Form of a Triangle, with Three Indentations on one of the Sides, and provided each with a Thread. Theſe being covered with ſomething that will make them ſtick to the Skin, are applied to the Lips of the Wound, one on each Side, which are thus drawn together and reunited by the Means of the Threads.

S, S. Are Two other very ſmall Pieces of Linen Cloth, or of Leather, of a different Figure from the former, provided likewiſe with ſome agglutinative Matter and Threads, and ſerving for the ſame End, *i. e.* to draw the Lips of the Wound together by the dry Suture, as it is call'd, eſpecially in the Wounds of the Face, to avoid all Manner of Diſfigurement, which elſe will be the infallible Conſequence of all the other Sorts of Sutures or Stitching.

Of BANDS *and* BANDAGES. *By* Lawrence Verdue. *By Way of Abridgment from the* French *Original.*

OUR Author diſtinguiſhes Bandages into Two Sorts, *viz.* the *Common*, being ſuch as may be applied to ſeveral Parts of the Body, and for different Diſeaſes; and the *Proper*, which are adapted to particular Parts and Diſorders.

As to the Difference betwixt a Band or Fillet, and a Bandage, he ſays, That a Band changes its Name as ſoon as it is applied to the Part, and then becomes a Bandage.

A Band or Roller he defines to be a long and broad Ligature, for ſurrounding, binding, and containing the Parts of the humane Body, and keeping them in a State of Health.

A Band does conſiſt of Two Parts, *viz.* the Body, and the Extremities or Ends. By the Body, is underſtood the Middle and the Thickneſs of it; and by the Extremities, both the Ends that run out lengthways, and thoſe that run acroſs, laterally.

Of Bandages there are Two Sorts, one Sort being Remedies of themſelves, and the other being intended only to keep the Medicaments on the Part, and therefore are call'd alſo *Contentive Bandages.*

The Difference of Bands or Rollers ariſes from Five Things, *viz.* the Matter, Figure, Length, Breadth, and Structure.

As to the *Matter*, ſome are made of Linen, others of Woollen, and others again of other Sorts of Stuffs. Our modern Chirurgeons do upon all Occaſions make Uſe of Bands made of worn Linen, becauſe with it they can bind hard or ſlacken at Pleaſure; they are eaſily waſh'd, and beſides, convey the Virtues of the Liquids to the affected Part better than any other Matter.

In Relation to their *Figure*, ſome are equally roll'd and gathered together, as thoſe applied to Fractures and diſlocated Joints; others are cut into ſeveral Heads, as thoſe for the Head, Chin, *&c.* and others again are made of ſeveral Rollers of different Figures, gather'd and ſtitch'd together, as thoſe for the Teſticles, *&c.*

As to the Difference ariſing from the Length, ſome of them are long, others ſhort, and ſome again of a middling Length, becauſe they muſt be adapted to the different Conſtitution of the Body, and the Length of the affected Part.

As to their Breadth, ſome are very broad, ſuch are thoſe for the Head, the Breaſt, and Belly; and others very narrow, as thoſe uſed for the Lips, Fingers, *&c.* and others again are of a middling Breadth, as thoſe uſed for the Arms or Legs, which muſt be fitted to the Breadth and Thickneſs of the ſeveral Parts where they are to be applied. Thus *Guidon* would have the Band for a Shoulder be Six Fingers broad; that for the Thigh, Five; for the Leg, Four; the Arm, Three; and for the Finger, One.

The Fifth Difference of Bands, relating to their Structure, is, That ſome are woven in the Nature of a Ribbon, of Thread, Worſted, and the like; and others are made of Linen Rags. Theſe laſt are moſt uſed now.

A Band conſiſts of Two Parts, *viz.* the *Body*, being the middle and thick Part; and the *Ends* or *Tails*, of which there are Four in Number, *viz.* Two longitudinal, and Two lateral.

Four Qualities are required in a Band or Roller:

The *Firſt* conſiſts in the Matter whereof it is made; as for Inſtance, the Linen muſt neither be too new, becauſe it will be too ſtiff; nor too old, for then it will tear. It muſt be ſmooth, plain, ſoft, fine and light, that it may not preſs upon nor hurt the Part.

The *Second* Quality is, that the Band muſt be clean and free from all Naſtineſs, that ſo they may be dipp'd in proper Liquids to allay Pain, or prevent Symptoms.

The *Third* Quality conſiſts in the well cutting of them, not acroſs, but down along with the Thread; for if the Linen be cut acroſs, it preſſes down only in the Middle of their Body, but not in the lateral Ends: But as for Compreſſes deſign'd for the Elbow, the Ham, or the Shoulder, *Willeman* adviſes to have the Linen cut croſsways.

The *Fourth* Quality is, That they ſhould be free of Liſt or Selvage, of Knots or Hems, and of any Thing elſe that may produce an Unevenneſs, and conſequently cauſe Pain, and a Defluxion of the Humours upon the affected Part.

Of the Nature and Differences of the BANDAGES, *&c.*

OUR Author defines a Bandage to be the Rolling or Rounding of Bands round an affected Part, together with the neighbouring and adjacent Parts.

The Differences of Bandages ariſe chiefly from Six Things: Firſt, the Time of the Operation. Secondly, the Simplicity or the Compoſition of the Bandage. Thirdly, the Manner of Binding up the affected Part. Fourthly, the Place where the Bandage is to begin, and where to end. Fifthly, in what Order the Rollers are to be applied. And Sixthly, the Nature of the Bandages, being either common or proper.

As to the Firſt Difference, relating to the Time of Operation, he obſerves, with *Hippocrates*, that we muſt diſtinguiſh betwixt a Bandage while 'tis yet making, and one that is already made: As to the former, it requires to be managed *cito, tuto, & jucunde*, *i. e.* with Diſpatch, Safety, and Eaſe or Dexterity.

The

The Chirurgeon ought to do his Work with *Diſpatch*, and ought to have every Thing in Readineſs, eſpecially if he is to undertake any Operation of Moment, that either at the Time of the Operation, or immediately after, he may not be to ſeek for what is requiſite for the Dreſſing or otherwiſe, which ſometimes may endanger the Patient's Life. He ought to do it alſo with *Safety*, *i. e.* he muſt avoid every Thing that may endanger his Patient, as much as poſſibly can be done: And laſtly, manage his Bandage with *Dexterity*, which will gain him the Eſteem of the Standers by, and render the Patient tractable and obedient to his Precepts.

And the Condition required in a Bandage that is already made, conſiſts in its being well adapted and ſuited to the Form and Figure of the Part, and the Indications of the Diſtemper.

The *Second* Difference of Bandages ariſes from their *Simplicity*, or *Compoſition*. A *ſimple* or *ſingle* Bandage is ſo call'd, becauſe it is made only of one Fillet or Band. It is made of a ſingle Fillet, *i. e.* without any Thing ſtitch'd or tack'd to it, and all its Circumvolutions or Rounds are ſimple alſo.

A *Compound* Bandage is oftentimes made with divers Bands or Rollers, cut and ſlit into Ends, or elſe ſome other ſmall Fillets are tack'd to the principal Roller, or elſe is applied by ſeveral Convolutions or Turns, different the one from the other.

Our Author diſtinguiſhes a ſimple Bandage into Two Sorts, *viz.* the *Equal*, and the *Unequal*. As to the Equal, it is only of one Make, *viz.* round and circular, incompaſſing the Part like a Hoop on a Cask, without turning to one Side or the other.

As to the *ſimple unequal* Bandages, the Authors do not very well agree in their Number. Our Author, according to the common Practice, divides them into Four Sorts, *viz.* the *Doloire*, the *Mouſſe*, the *Renverſed*, and the *Creeping* Bandage; but afterward reduces them to Three, by leaving out the *Mouſſe*, it being very near the ſame with the *Doloire*, and differing only in this, that the *Doloire* is a ſimple unequal Bandage, carried upwards or downwards, ſo as to leave the Fourth Part of the Band uncovered; and the *Mouſſe* is alſo a ſimple unequal Bandage, and the ſame with the former in all Reſpects, excepting that a Third Part of the Band is left uncovered.

The Second ſimple unequal Bandage is call'd the *Renverſed*, and is uſed on the Limbs of the Body, to render the Parts equal; as for Inſtance, in the Leg, by carrying the Bandage from below upwards, and making Pleats or Reflexions under the Muſcles that make the Calf of the Leg, and thus make the Leg even.

The Third ſimple unequal Bandage is called the *Creeping*, from its being turn'd round the Parts in a Serpentine Way, ſo as to leave a Space betwixt every Two *Convolutions*. It is deſigned only for the containing and keeping on of Medicaments.

As to Compound Bandages, our Author, after *Galen*, takes their Differences from Three Things: Firſt, from the Part affected; Secondly, from ſome Accident or other; and Thirdly, the Similitude of the Part.

Thus many Bandages have obtained their Names from the affected Parts unto which they are applied, being call'd the *Eye*, the *Noſe*, the *Breaſt*, *&c.*

Others there are which have deriv'd their Denominations from ſomething or other unto which they bear a Reſemblance in their Figure, as the Lozenge, the Creeping, the Crab, *&c.*

The Third Difference of the Compound Bandages has a Relation to the Manner in which the affected Part is bound; it being certain, that, conſidering the different Figures of the Parts of the Body, as well as the different Diſeaſes they are affected with, they cannot be bound up all after the ſame Manner.

Thus in a compleat Fracture of a Leg, we begin with a Band roll'd up to one Head; but in a Fracture of the *Clavicle*, with a Band of Two Heads; and in divers other Caſes we begin with the End of the Roller or Fillet, *&c.*

The Fourth Difference ariſes from the Place where the Bandage begins and ends. This Difference is taken from the Place where the Firſt End of the Roller or Band is laid on, and where the other End does terminate, being of the greateſt Conſequence in the Practice of Chirurgery.

Now

Now a Bandage does begin either at the Part affected, or elſe at ſome adjacent Part, or elſe at that Part that is directly oppoſite to it.

There are Three Indications that induce a Chirurgeon to make the firſt Convolutions or Rounds upon the affected Part it ſelf: Firſt, to repel the Humours (as in Fractures) back upon the ſound Parts, and to prevent Defluxion upon the affected Part, and then to finiſh the Bandage towards the upper Parts, or towards the Head of the Veſſels. Thus in Contuſions alſo the Bandage muſt be begun upon the very Part where the Contuſion is, to prevent a Stagnation or Flux of Blood, and Inflammation and Suppuration, and ſuch-like Caſes, according to the Direction of *Hippocrates.* They ought to begin the Bandage upon the Part affected, and that in the Middle of it, rolling the the Band hard about it, and ſo continuing till it is pretty tight; after which the End of the Roller muſt be carried upwards, and there made faſt.

The *Second* Indication for the Beginning of the Bandage upon the affected Part, is to diſuntie and ſeparate ſuch Things as are apt to unite and glue together, as in Burnings upon the Chin, Fingers, *&c.*

The *Third* Intention is to keep the Medicaments upon the affected Part, and then it is ſtiled a *contentive* Bandage.

There are Two Reaſons likewiſe for the Beginning the Bandage upon an adjacent Part:

Firſt, when you are to reduce a diſlocated Bone; as for Inſtance, ſuppoſing the *Condylus* of the *Tibia*, which is articulated with the Thigh-Bone, to have ſuffered a Luxation to the Outſide, then the Firſt Caſt of the Band is to be laid on the Inſide; after which you muſt roll it hard round the Outſide where the Luxation happened, and end the Bandage at that Place from which the Bone was diſlocated.

Secondly, when there are any Ulcers that require an expulſive Bandage; as for Inſtance, ſuppoſing an Ulcer to be ſeated a little above the Ankle, you are to begin to wind the Band under the Sole of the Foot, and then mount upwards by *Doloires*, *i. e.* ſuch Convolutions as leave the Third Part of the Roller uncovered, making Plaits till you come to the Calf of the Leg; and then carrying it up to the Garter-Place, augment the Conſtriction, and there terminate the Bandage. This is ſtiled an *Expulſive* Bandage, becauſe it expels the Humours out of the ſinuous Parts of the Ulcers.

The *Third* Way of managing a Bandage is, when the Binding of it is begun on the oppoſite Part where the Wound is: Thus for Inſtance, if a Wound is received lengthways on the Middle of the Forehead, the Parts muſt be reunited by Means of a Band with Two Heads, perforated in the Middle: The Middle of the ſaid Roller is to be applied to the Nape of the Neck; which done, the Two Heads of it, in each Hand One, are brought from behind forward, and paſſing one of the Heads through the Hole in Middle of the Band, ſo as to make the Middle of the Slit to come directly upon the Wound; after which, as many Turns are to be made as are judged ſufficient for the Reunion of the divided Parts.

The *Fifth* Difference of the Bandages has its Riſe from that due Order that is to be obſerved in ſimple Fractures, which does require a certain Number of Rollers, Compreſſes, and Paſtboards.

The Firſt that are applied here is the Under-Roller, and that directly upon the Fracture, and to make Three Turns about it; as for Inſtance, in caſe the *Os Tibiæ* be broken, and the Bone ſtands to the Outſide, the Firſt Turning with the Band muſt be made from the Inſide outwards, ſo as to make Three Turns round the Fracture; and in caſe the ſaid *Tibia* ſhould be broken, and throw the broken Bone inwards, then the Firſt Round of the ſame Under-Roller muſt be made from the Outſide inwards, ſo as that Three Rounds may be made about the Fracture it ſelf, and from thence go upwards with *Doloiers*, and renverſed or plated Turns, and let your Bandage end at the Gartering-Place.

Monſieur *Verdue* ſays, That this Roller or Band ſhould be Three good Inches in Breadth, or more, in Proportion to the Leg, and Three Ells long: That the Second Under-Band muſt be of the ſame Breadth, and Three Ells and half long: That with this the Chirurgeon is to make Two Turns round the Fracture, ſo as to caſt them the

ſame

ſame Way with the former, and then run it down under the Sole of the Foot, and then carry it upwards again, but with fewer and ſlacker Rounds than thoſe of the Firſt were.

This Second Under-Band, beſides that it is longer, and its Turns are fewer and ſlacker than thoſe af the Firſt, has its Interſtices betwixt the Turns larger than in the Firſt.

Beſides theſe Two Under-Bands, there is an Upper-Bandage belonging to the Fractures, and this is made up with Two Rollers or Bands alſo. With theſe Two Upper-Bands or Rollers the Chirurgeon muſt begin to roll the Firſt of them on the Outſide upon the Fracture, ſo as to make only one Turn round, and then run upwards, and end where the Under-Bands do.

The Second Upper-Band or Roller is to be applied above, and brought downwards to the Place where the Firſt was begun, ſo as to make the Rounds from the ſame Side with the Firſt, but not quite ſo cloſe.

Four Uſes are aſſign'd by *Hippocrates* and *Galen* to this Upper-Bandage: (1.) To keep the fractur'd Extremities of the Bones firm together. (2.) To ſtrengthen the Under-Bandage. (3.) To retain the Compreſſes in their right Places. And, (4.) To hinder the Paſtbords from preſſing too hard upon the Parts.

The Sixth Difference of Bandages being taken from the affected Parts unto which they are to be applied, 'tis from thence that they have been diſtinguiſh'd into *Common* and *Proper* Bandages: The *Firſt* are ſuch as are ſuited for ſeveral Parts and different Indiſpoſitions of the Body, and the *latter* are, ſuch as are adapted only to ſome certain Parts and Diſeaſes, and conſequently are improper in any others.

Our Author farther tells us, That the *ſimple common Bandages* are either equal or unequal, under or upper Bandages, incarnative, expulſive, retentive; adding, that ſome Bandages are Remedies of themſelves; whereas others are intended only to keep the Medicaments upon the affected Parts.

Thoſe that are Remedies of themſelves, he ſubdivides into *Uniting*, *Dividing*, *Expulſive*, and *Attractive*.

The *Uniting* Bandages are uſed in Fractures, oblong Wounds, *&c.* The *Dividing* Bandages in Burnings of the Fingers, and of the Chin, to keep them from ſticking together: The *Expulſive* Bandage is applied to ſqueeze out of a ſinuous Ulcer the Matter contained therein: And the *Attractive* is deſigned to recal the Spirits to a Part decay'd for Want of them there.

As the *Contentive* Bandage is deſign'd only to keep the Medicaments upon the Parts, ſo this is the only that the Neck will admit of, by Reaſon of its being employed in Reſpiration and Deglutition.

Of FRACTURES *in General. Taken out of Monſieur* Le Clerk, *Phyſician in Ordinary to the* French *King, his Treatiſe of the Diſeaſes of the Bones.*

THE Antients have left us Five Sorts of Fractures, diſtinguiſh'd by the *Greeks* by their peculiar Names.

They have given the Name of *Raphanidon* to that Kind of Fracture, when the Bone is broken clean off through its whole Bulk like a Carrot; and *Crambeon* to that Kind where the Extremities of the fractured Bones have certain ſmall Filaments, not unlike unto thoſe we obſerve in the Stalk of a Cabbage that is broken aſunder.

They call *Schidaridon* that Sort of Fracture when the Bone is crack'd or ſplit lengthways, like a Plank: And *Alphitidon* that Sort where the Bone is crack'd into ſeveral Pieces, like a Nut that is crack'd.

They have given the Denomination of *Calamidon* to that Kind of Fracture where the

the Bone is ſplit in a ſtreight Line in ſome of its Parts, but at the End turns or is incurvated like a Creſcent or an Angle.

Moſt of theſe Diſtinctions are of little Uſe in the Practice of Chirurgery, and therefore we will content our ſelves to ſay, with *Galen*, in general, That all the Fractures are made Two different Ways, to wit, either in Length, or elſe croſswiſe.

When a Bone is ſplit or broken lengthwiſe, *i. e.* according to the Extent of its Fibres, this is called a Cleft or Fiſſure.

When the Bone is broken croſswiſe, *i. e.* through its Thickneſs, this is call'd properly, according to the common Acceptation, a Fracture, which may be either horizontal, or oblique; and either of them may be *ſimple*, or *compounded*, *i. e.* with a Wound, Ulcer, or Diſlocation.

Some alſo do diſtinguiſh them into *compleat*, and *incompleat*. This Diſtinction is moſt commonly applicable only to thoſe Parts where there are Two Bones. 'Tis nevertheleſs my Opinion, That when there is but one Piece that is ſeparated from the Body of the Bone, ſuch a Fracture may be ſtiled *incompleat*.

That Cracking or Splitting of a Bone, which is call'd *Fiſſure*, happens alſo when a Bone that is very dry, and ſubject to be broken, receives a violent Shock from or againſt ſome very hard Bodies.

Theſe *Fiſſures* are very hard to be diſtinguiſh'd or diſcovered, eſpecially if they happen to be but ſmall, and when they are often not diſcovered, but by ſome very pernicious Symptoms that enſue.

The moſt aſſured Signs are, a fixed and continual Pain, which ſometimes does encreaſe, and then decreaſe, according to the Bigneſs of the *Fiſſure*; a ſmall Tumour, which turns red in Proceſs of Time; and a certain Difficulty of making Uſe of that Part: But after all, theſe Signs are not infallible, becauſe theſe Symptoms may owe their Origine to a great Contuſion of the *Perioſteum*. The ſureſt Sign, and ſuch as proves moſt fortunate both to the Chirurgeon and Patient, is, if theſe Fiſſures happen to be ſo large, as to be diſcoverable by the Touch of the Fingers.

Moſt commonly this Tumour does not appear till a conſiderable Time after, becauſe the Juices which iſſue out through this Fiſſure, do encreaſe and ſuffer an Alteration only by Degrees, till at laſt they introduce a *Caries* in the Bone; and being ſettled betwixt the *Perioſteum* and the adjacent Parts, produce an Abſceſs, or a Wound, which degenerates into an Ulcer, and proves very ſtubborn; will hardly come to a Suppuration, and is never to be reunited till the Bone be laid open, and its Exfoliation be over.

Sometimes this corroſive Juice deſcends all along the Bone towards the adjacent Parts that lie beneath it. Here it gathers, and produces an Abſceſs and an Ulcer, whilſt the Bone goes further and further into a *Caries*, which may deceive even the moſt expert Chirurgeon, becauſe the head Spring which feeds it is at a good Diſtance, and 'tis impoſſible to be healed up, without you firſt diſcover the Fiſſure of the Bone, in order to procure its Exfoliation, as we told you juſt now.

And after all, (as I ſaid) this Tumour is not an infallible Sign, for all this may be cauſed by a Contuſion of the *Perioſteum*, or by the Opening of the ſmall Veſſels, which have ſuffered a Diſruption betwixt it and the ſound Bone.

When there is a *Fiſſure* or Cleft in the Bone, the beſt Advice I can give you is to make a very ſtreight Bandage, and yet it is very difficult, if not quite impoſſible, it ſhould be ſufficient to draw the Two Sides of the *Fiſſure* cloſe together, eſpecially if it does not reach above half Way through the Thickneſs of the Bone, and does not extend it ſelf quite through its Length. In caſe the Chirurgeon is able to diſcover the *Fiſſure* by the Means of his Finger, I would adviſe him to manage it like a great Contuſion, by applying the ſtrongeſt reſolvent Medicines that may be.

The Cauſes of the Fractures that run croſswiſe, are either *Internal*, or *External*. Among the *Internal*, the *Caries* is the moſt frequent, as it happens in thoſe affected with the *French* Diſeaſe, and with the Scurvy.

The other Cauſes are, a Defect of the nutritious Juice, and of the Marrow, a Softneſs, and every Thing elſe that may render the Bones ſubject to Fractures.

The external Cauſes are, Blows or Stroaks, Falls, Fire-Arms, *&c.*

The Signs of a fractured Bone are, Pain, and a Difficulty of making Uſe of it; but theſe Signs are not certain, becauſe they appear ſometimes when there is no Fracture, to wit, when they owe their Origine either to a *Fiſſure*, or to a Contuſion, or perhaps to both at once.

There are ſome Fractures alſo that are not attended with Pain, and do not impair the Uſe of the Part, to wit, when the Extremities of the fractured Bone have no Inequalities, but are remaining in their Poſition one upon the other. This often happens in thoſe Parts where there are Two Bones placed together, as in the fore Arm and in the Leg, but more eſpecially in the Leg, when the *Perone* has been only fractured. 'Tis certain that there are not wanting Inſtances, that when the *Perone* has been broken, as alſo when the *Tibia* alone has been fractured, the wounded Perſons have not only been able to ſtand upright, but alſo to walk for ſome Time, without any remarkable Inconveniency.

The moſt certain Signs of a Fracture are, firſt of all, when the Part which was ſtreight before, begins to bend or be crooked, or becomes ſhorter than it was before; but after all, this does not happen thus at all Times; and if it appears ſhorter, you muſt well examine, whether the ſame is not occaſioned by ſome Luxation in the Part, which ſometimes will happen by a ſlight Accident.

When you find that the Part will bend or give Way as you touch it with your Hand or Finger, or when you diſcover ſome Splinters, or if you are able to hear a cracking Noiſe whilſt you are managing or turning the Bone different Ways, all theſe are Signs of a Fracture.

A Fracture is ſoon diſcovered in lean People, as alſo in thoſe Parts where there is but a ſlender Seam of Fleſh upon the Bones; in thoſe Parts where there is but one Bone, or if there are Two, when both of them are broken.

A Fracture is alſo eaſie to be found out when it is not attended with any Contuſion or Tumour, or when there are ſome Splinters in it.

On the contrary, a Fracture is very hard to be diſcovered in very fat People, in thoſe Parts that are covered with very thick Muſcles; in thoſe Parts which have Two Bones, one whereof is only fractured.

If it be in the Leg, and that the *Perone* is only broken, and you meet with great Difficulty to diſcover the Fracture by the Help of your Fingers, by Reaſon of the Thickneſs of the Part which covers the Bone that is ſuſpected to be fractured, you muſt proceed in the following Manner:

If the Fracture is in the Thigh or the Leg, the Chirurgeon muſt order the Patient to ſet the Sole of the Foot againſt his Breaſt, and to thruſt hard againſt it, and if he finds the Part to bend or give Way, and hears a Noiſe whilſt he is ſtirring it, there is the Place of the Fracture.

If a Fracture happens in the Ribs, you muſt order the Patient to bend or incline his Body to that Side which is ſound, which will enable you to diſcover it the better with your Fingers.

In general, a ſimple Fracture is much more eaſie to be reunited than a complicated one; and among the ſimple, as well as the complicated Fractures, thoſe that are without Splinters are beſt to be managed; and the moſt difficult of all are thoſe that happen in a Bone which is covered with very thick Fleſh, as in the Thigh-Bone: For beſides that it is very hard to be found out, it is ſtill more difficult to ſet it again, and when it is reduced, to keep it in its Place; or elſe in thoſe Parts where there are Two Bones which ſuſtain one another.

The moſt dangerous Fractures of all are thoſe that are made by Fire-Arms; thoſe where the Bone is broken into many Pieces, which prick and tear the Tendons aſunder; and laſtly, thoſe where the Extremities of the broken Bone do tear the Fleſh, and penetrate through the Wound which has been made by them.

Thoſe Fractures that owe their Origine to an internal Cauſe are incurable, Amputation being the only Remedy here, as well as in thoſe that are cauſed by a *Caries*, or by the Softneſs of the Bone. In theſe however you may attempt the Reunion of the Bone; though it proves a very hard Task to

conſolidate the Bones that are naturally ſubject to Fractures. Thus the Bones in aged People require a much longer Time to be reunited than thoſe in young People; ſo that even in thoſe Fractures where they do proceed from an external Cauſe, you muſt have Recourſe ſometimes to an Amputation, as in the Fractures of the Joints; notwithſtanding which, many of theſe are cured without it, but then it requires all the Application and Induſtry the moſt dextrous Chirurgeon is capable of in ſuch-like Caſes.

In thoſe Fractures where a large Artery is broken or opened, and the Blood is not to be ſtopp'd, as alſo in thoſe where the Bone is ſhattered or broken all to Pieces, you muſt have Recourſe to an Amputation.

You muſt make Uſe alſo of an Amputation in thoſe Fractures where the Tendons and Ligaments of a certain Part are torn to Pieces, in ſuch a Manner that there is no Proſpect or Hopes of reſtoring the fleſhy Part, though it were not impoſſible to conſolidate the Bone.

The Cure of the other Fractures occaſion'd by external Cauſes depends on Two Things: The *Firſt* is, to prevent the Symptoms, and to endeavour to remove them if they happen to ſupervene: And the *Second* is, to procure its Reunion.

To anſwer the Firſt Intention, you muſt make Uſe of the general Remedies, as Phlebotomy, Clyſters, Ptiſanes, the *great Diet*, but eſpecially during the Firſt Days, according to the Strength and Conſtitution of the Patient, and the Nature and Degree of the Diſeaſe, as well as the Symptoms that attend it.

In Reſpect to the Symptoms, you muſt take Care to manage the complicated Fracture in a quite different Manner than the ſimple.

If a Fracture is accompanied with a Luxation, the ſame muſt be reduced before the Fracture. If there be a great Flux of Blood, this muſt be ſtop'd before you apply the Bandages. If there be a Wound, or a conſiderable Ulcer, which requires much Suppuration, and frequent Dreſſing, you muſt, after you have well ſet the Two Extremities of the broken Bone together, put the affected Part into ſuch a Poſition, that the Wound may be dreſſed without being obliged to remove the Part from its Place, and that the purulent Matter may be able to make its Egreſs without any Obſtacle, or being detained, eſpecially upon the Bone, becauſe it would not only prevent the Formation of the *Callus*, but alſo introduce a *Caries*.

'Tis for this Reaſon that in caſe there is a Wound or an Abſceſs ſupervenes in ſimple Fractures, and that there is no free Egreſs for the purulent Matter, 'tis much better to make a ſhort Inciſion, or to dilate the Wound or Aperture that was there before, than to ſuffer it to lodge upon the Bone.

If there are any Splinters, you muſt endeavour to reduce them to the Bone, provided they are not entirely ſeparated from the *Perioſteum*: If it happens thus, you muſt draw them out through the Wound, which you muſt dilate if it be not large enough to give Egreſs to them.

If there is any extraneous Body, ſuch as a Bullet, *&c.* in the Fracture, you muſt draw it out through the Wound at the Firſt Dreſſing if it be poſſible.

The Parts that are thus fractured muſt be placed in a certain Caſe made for that Purpoſe, and muſt always be longer than the affected Part for the Uſe of which they are deſigned.

For the Fractures of the Arm, you muſt provide Engines or Caſes made of Tin Plates. You muſt apply but one contentive Bandage, which is call'd the Bandage with Eighteen *Chiefs*, or a Bandage for a complicated Fracture. By the Help of this you may dreſs the wounded Perſon, without being obliged to alter the Poſition you have thought fit to put the Part into before; and you muſt make Uſe of this Bandage till the Wound is quite cured; but you muſt nevertheleſs not neglect to change the whole Furniture from Time to Time, for fear of the purulent Matter, which may run or ſettle betwixt it and the exulcerated Part.

For this Purpoſe you muſt take ſome ſmall Pieces of fine Linen Cloth doubled together, and let them ſlip gently along the Part, but eſpecially where the purulent Matter has moſt Vent or Strength, that ſo you may have an Opportunity of changing them at each Dreſſing, and to keep the Bandage the longer neat and clean. Laſtly, you muſt

muſt take Care to lay in the Bottom or at the Sides of the Engine or Caſe with ſoft Pillows, the better to keep the affected Part firm, ſteady, and eaſie: And if the Fracture be in any of the inferior Parts, you muſt always put a Cuſhion with a Hole in the Middle, that it may be kept ſteady.

A ſimple Fracture muſt be managed in the ſame Manner, if it is followed by an Abſceſs, or attended with a great *Equimoſis* or Inflammation, or ſome very conſiderable Contuſion; and you muſt keep the affected Part in the ſame Poſition, till ſuch Time that all the Symptoms are either entirely remov'd, or at leaſt brought to ſuch a State, that the Bandage may be applied without any further Obſtacle. For Want of taking Care of theſe Things it happens often, that they are attended with Abſceſſes, Ulcers, and a Gangrene of the Part.

The ſame Symptoms may happen to the ſimple Fracture, though they are without Inflammations or Contuſions, in the following Caſes:

(1.) When the Bandages are made too ſtreight.

(2.) When you make Uſe of Splints that are too hard, and which preſs cloſe upon the bare Part, eſpecially upon thoſe Parts of the Bone which are little or not at all covered with Fleſh, as at the Ridge of the *Os Tibiæ*; for which Reaſon it is, that no Splintering of that Ridge of the Bone of the *Tibia* is admitted of in the ſimple Fractures of the Leg.

(3.) When either the Bands or the Compreſſes are doubled too thick together; for which Reaſon it is alſo, that you muſt cut out or remove all the Seams, Hems, and other Impediments.

(4.) When we apply ſuch Emplaſters as cauſe Excoriations or Corroſions, which ſometimes produce *Flictenes*, or Exulcerations in the Part.

There are many Inſtances to be given of each of theſe before-mentioned Caſes in particular, for which we may eaſily account in the Three Firſt Caſes; for the Fleſh and Veſſels ſuffering a Compreſſion, the Blood has not its full Liberty to move in them: Thus it ſtops by Degrees in the Veins and the Poroſities of the Fibres, and tumefies and dilates them to ſuch a Degree, that at laſt they cauſe a Diſruption and an Inflammation on all Sides, which produces a Tenſion and Inflammation, and diſcolours the Part.

The Tumefaction is the Cauſe why the Band makes ſtill a greater and ſtreighter Compreſſion upon the Part, which more and more interrupts the Courſe of the Blood and the Humours, and prevents that Part which is ſtopp'd from being renew'd by the Intermixture of the freſh Arterial Blood.

The exceſſive Tenſion of the Membranes is the Cauſe why they ſuffer abundance of Divulſions, from whence ariſe moſt violent Pains, which encreaſe by the pernicious Quality theſe Juices acquire by their Stagnation, for they turn ſowr and corroſive to ſuch a Degree, that they do prick, corrode, and tear to Pieces the Fibres and the Membranes, which produces the higheſt Degree of a Gangrene. Sometimes ſome Part of the Blood does extravaſate, turns to Matter, and cauſes an Abſceſs.

When the moſt fluid and ſubtil Part of this Blood inſinuates it ſelf under the *Epidermis*, or the *Cuticula*, by its Stagnation there for ſome Time, it corrodes it, and cauſes certain ſmall Ulcers. It is coagulated and expanded all along the Part, and produces but one Ulcer, that covers the whole Part.

If it does only ſeparate the *Epidermis* of the Skin, it gathers under it, and produces a Kind of Bladder full of a reddiſh Water or Seroſity, it being nothing elſe but the cold Seroſity of the corroſive Ferment, and theſe are thoſe Veſicles or Bladders which are call'd *Flictenes*, and are not unlike unto thoſe that are raiſed by Burning. The ſame Symptoms are produced alſo by Emplaſtick Remedies.

To give you a clear Idea of this Matter, it is to be obſerved, That though the Fracture ſeems to our Eye-ſight not to be attended with any *Equimoſis*, or any Contuſion, 'tis impoſſible but that in its interior Part there are a Thouſand ſmall Fibres, which are cruſh'd to Pieces and put out of Order as well as the Capillary Veſſels, through which ſome few ſmall Drops of Blood run out, and this does render the Circulation of the Blood and of the *Lympha* more ſlow

and unequal in that Part, from whence proceeds the Tumour, which is commonly obſerv'd in the fractur'd Part, as likewiſe the Inflammation and the *Oedemus* which follow upon it, eſpecially in the Beginning.

'Tis to be obſerved, that in a living Body all the Humours, even after their Extravaſation, are carried off in a great Meaſure by Tranſpiration; for when the Pores are open, not only the volatile but alſo the moſt corroſive Parts are diſperſed without Intermiſſion, and conſequently the affected Part is freed in a great Meaſure of the pernicious Humours: But in caſe theſe Pores are obſtructed by Emplaſtick Remedies, the Tranſpiration is abſolutely interrupted, and a Million of ſmall Particles or Bodies, which would have been evaporated, are detained in that Part, where encreaſing the Swelling of the fleſhy Part which covers it, they cauſe a Compreſſion upon the Veſſels, which ſtill interrupting more and more the free Paſſage of the fluid Humours, produces at laſt moſt violent Pains, an Inflammation, and all the other Symptoms we have mentioned juſt now.

The ſame Symptoms will appear ſometimes though no Bandages are applied to the Part, nor any Emplaſtick Remedies, and then are produced only by the Tenſion of the interior Parts.

The moſt dangerous Inconveniency of all ariſes from the Two ſtreight Bandages. This is beſt diſcovered by the Pain the Patient feels in the affected Part, and when the Veins of the Feet are ſwell'd like unto the Veins in the Hand, when we are to be let Blood, by the Swelling, Tenſion, and Change of the Colour of the Part that is below it.

All theſe Symptoms owe their Origine only to the Interruption of the Courſe of the Blood, and of the *Lympha*, in the ſame Manner as has been related before.

In ſuch a Caſe as this you muſt with all poſſible Speed ſet the Part at Liberty; and if the before-mentioned Symptoms do not appear as yet, you muſt foment it with the Aromatick Spirit of Wine, and apply a Bandage to it that is not ſo ſtreight. If the *Flectenes* do appear, you muſt open or cut them with a Pair of Siſſars. If the *Epidermis* is raiſed, if there are ſmall Ulcers that have occupied the whole Part, you muſt ſeparate the *Epidermis*, and bathe it with the *yellow Water*. If the Part is very hard, extended, without Pain, and livid, you muſt make Uſe of Scarrifications, which muſt be made more or leſs deep, according to the Degree of the Mortification, or according as you think there is more or leſs Danger of it: Afterwards you muſt foment the Part with the Tincture of *Myrrhe* and *Aloes*. The Scarrifications you may bathe with Spirit of Wine, or you muſt diſſolve a leſſer or larger Quantity of the *Unguentum Ægyptiacum*, according to the Degree of the Mortification. Laſtly, in all theſe Caſes you muſt make Uſe only of the *containing Bandage*, and put the affected Part in an Engine or Caſe, ſuch as is commonly uſed in the complicated Fractures, till ſuch Time that all the Symptoms are appeaſed.

In a ſimple Fracture, where the Splinters are entangled within the Subſtance of the Fleſh, ſo as that they cannot be reunited to the Body of the Bone, or when they are quite ſeparated from the *Perioſteum*, you muſt not ſo much as think of a common Bandage, becauſe the Splinters would be apt to tear the adjacent Parts, and conſequently produce more violent Pains in the Patient, a Fever, an Abſceſs, and endanger the whole Part, if not Life it ſelf.

In ſuch a Caſe as this you muſt make an Inciſion upon the Splinters, and take them out, eſpecially in the Fractures of the Ribs. If the Fracture be accompanied by a Wound, you may draw them out through the Orifice of the Wound; and if you cannot ſeparate and take them out, you muſt let them come out with the purulent Matter; but you muſt put no Tent into the Wound in the Fractures of the Ribs, where the Splinters do prick and tear the *Pleura* aſunder. If in a Fracture attended with a Wound, one or both the Extremities of the Bone come out through the Wound, and there is no Poſſibility of ſetting them again, you muſt ſaw them off.

If you propoſe to reduce or ſet the Bone into its natural Poſition, Two of the Chirurgeon's Aſſiſtants muſt draw gently both the Extremities of the fractured Bone backwards, whilſt he himſelf with his Hands fits and ſets it to the natural Figure of the Part; and if he meets with an

Splinter

Splinters, he muſt endeavour to fix them again to the Body of the Bone. You may conclude the Fracture to be reduced or ſet when you find the Part to be even, and when in touching it with your Fingers, the Patient does not find it quite ſo painful; as alſo when, by comparing it with the oppoſite ſound Part, you find that they are both equal, and of the ſame Figure.

In caſe the Fractures of the Bones are ſlip'd one over the other, you muſt make your Extenſion the larger; and the ſame muſt alſo be much greater when the Fracture happens to be croſswiſe, than when it is horizontal: And after all, this Extenſion muſt be proportionable to the Strength of the Muſcles of the Part.

Sometimes the Hands alone are ſufficient to manage this Extenſion; but there are certain Caſes alſo where you muſt have Recourſe to Inſtruments and Engines; as for Inſtance, in the Fractures of the Thigh, where the Hands are not capable to encompaſs it, unleſs it be in young Children.

In caſe a Fracture is attended with great Contuſions, an *Equimoſis*, or Inflammation, you muſt not be too forward in making theſe Extenſions, in order to reduce the Fracture: 'Tis much better to let it a little alone till the Violence of the Symptoms is ſomewhat allay'd, eſpecially if the Bones are not much put out of their Place, and the Symptoms owe their Origine rather to the Blow or Fall, than the Fracture of the Bone, *&c.*

So ſoon as the Bone is well ſet, if it be a complicated Fracture, you muſt have all your Implements in Readineſs. You muſt be provided with every Thing that is requiſite, and put upon the fractured Part, whilſt Two Aſſiſtants keep the Part in the ſame Poſition, and draw it gently and equally on each Extremity of the Part, and let it go down both at the ſame Time, in order to put it upon the Plan of the *Bandage* of *Eighteen Chiefs*. The Chirurgeon muſt keep his Hands upon the Place where the Wound or Fracture is, till ſuch Time that the Part is rightly fix'd, and the Aſſiſtants muſt keep it firm and ſteady, whilſt the Chirurgeon himſelf is dreſſing the Wound, and applying the Bandage.

There is one Caſe peculiar, that is, when there is a long Splinter, which is raiſed above the Bone, and when there is a Wound both above and below, or perhaps both. In this Caſe you muſt be provided with a ſmall and very narrow Band, wherewith you muſt make Two or Three Rounds or Windings upon the Middle of the Splinter, in order to keep it down whilſt you are dreſſing the Wound.

As for the Dreſſing and Bandage of a ſimple Fracture, the Two Aſſiſtants muſt hold up the Part, raiſed and extended in the ſame Poſition, ſo that each of them does draw gently and equally at each Extremity, without ſtirring to one Side or the other whilſt the Chirurgeon is dreſſing it. It muſt be fomented with Spirit of Wine, of Turpentine, and with Oil of Earthworms.

He muſt cover the Part with a Compreſs moiſten'd with the ſame Remedy, if there be ſlight *Echimoſis*. This Compreſs muſt be ſlit aſunder about the Two Third Parts of it, that you may adapt it the better to the Part, without being obliged to make a Counterturn or Winding. You muſt dip into or moiſten the other Compreſſes and Bands with *Oxycrate*, in order to refreſh the Part, and make them ſtick the cloſer together.

Some General Obſervations concerning the FURNITURE *appertaining to the* FRACTURES; *and more particularly to the ſimple Fracture of a Leg.*

First of all, you muſt make Three Turns or Rounds with the Firſt Band, about the Place where the Fracture is, which ſerves for Two Uſes; Firſt, to prevent the *Callus* from growing too thick, and conſequently introducing a Deformity in the Part; and Secondly, to keep that Part the more firm, being the only one that wants to be kept under, as the moſt likely to be put out of its Situation.

Some are of Opinion, That you muſt apply the End of this Band on that Side where the Bone ſtands out moſt; but this ſeems to me to be a uſeleſs Obſervation, becauſe the Firſt Turning or Round about the Band does equally cloſe up the whole Circumference of the Bone which it ſurrounds, which does not reſiſt any more in that Place unto which the Extremity of the Band is applied, than in any other Part. On the contrary, it ſeems rather as if it did reſiſt more in that Place which is oppoſite to that where the End of the Band is applied.

Secondly, you muſt take Care to lay the End of the Band very cloſe under that Part of the Band wherewith you make the Three Firſt Turns or Rounds, becauſe from thence does depend the ſteady and firm Poſition of all the reſt of the Bandage; for if the Three Firſt Turns are too looſe, they will either give Way, or elſe run downwards, or ſometimes alſo, when you make other Rounds over them, they will run up double, or into Pleats, and prove very incommodious to the affected Part.

Thirdly, you muſt make Uſe of circular Windings, and not of the *Doloires*, becauſe the circular Ones are more firm; and we make Three of them, that by multiplying the Turnings about the Part, they may keep it the more ſteady and firm in that Place where the Fracture is made, as well as the End of the Bandage.

Fourthly, after this you may make the *Doloires*, becauſe you are obliged to take up a pretty long Extent; and theſe muſt be made more or leſs cloſe to one another, according as the Part is more or leſs round, becauſe the *Doloires* that are pretty cloſe to one another do not give ſo much Way as thoſe call'd the *Mouſſes*, and the *Doloires* that are farther aſunder; and theſe again do not give ſo much Way as thoſe that are called the *Rampant*, which are a Sort of Turnings of the Bands, that reſemble unto the Convolutions of a Serpent, which has twiſted it ſelf round the Stem of a Tree.

Fifthly, you muſt make renverſed Turnings in thoſe Places of the Part which are unequal.

(1.) To prevent the Bandage from cloſing together, or of lying hollow like the Bottom of a Sack, which would be apt to hurt the affected Part, and make the Bandage ſlip from its Place.

(2.) The better to fill up the hollow Places. There are certain Parts wherein theſe croſs Turnings cannot take Place, and where they are made for no other Purpoſe than to alter the Direction of the Band, as may be obſerved in the Bandages call'd the *Caplines*. There is another Caſe alſo, where they are made only for the Covering of the Part, and ſo give an Opportunity of enlarging the Band, as is obſervable in that Turning that is made about the Sole of the Foot. You muſt always make your Beginning with theſe croſs Windings in the interior Part of the Leg, becauſe that Part is more hollow, and leſs provided with Fleſh, and manage Matter ſo, that their middle Part may meet at the poſterior Part of the ſaid Part, and that they may always be placed in the ſame Line, the better to fill up the void Spaces.

Firſt, after you have made the Three Firſt Rounds of the Bands, you aſcend towards the Knee by the *Doloires*, and then faſten your Bandage both below and above the Bending of the Knee, to make it hold the better. The Second Band muſt be applied immediately upon the Firſt, by making Three Circumvolutions upon the Place of the Fracture, in order to ſtrengthen the Three Firſt Turns of the Firſt Band.

(1.) The Three Firſt Rounds are ſtreighter than the reſt, becauſe they are to keep firm and ſteady both the Fracture and the End of the Bandage.

(2.) You muſt deſcend from thence downwards, in order to ſecure the inferior Part of the fractur'd Bone, the ſuperior Part having been ſecured already by the Firſt.

(3.) As you deſcend you muſt make *Doloires*, and thoſe very ſtreight, for Reaſons alledged before.

(4.) In caſe the Bandage runs together into Pleats, you muſt make Uſe of the renverſed Band.

(5.) You muſt convey one Turn of the Band about the Sole of the Foot. This Winding ſerves for a double Uſe:

Firſt, it ſerves to faſten the better the *Doloires* you have made downwards, as alſo thoſe you are to make upwards again, and prevents their Slipping from their Places.

Secondly,

Secondly, they keep the Sole of the Foot ſteady and a little bent; for the *Muſculi Extenſores* of the Foot being much ſtronger than the *Flexores*, their Action is in ſome Meaſure counterballanced by theſe Turns of the Bands; ſo that the Muſcles may not be ſhorten'd, and keep the Foot extended; the Conſequence whereof would be, after the Fracture is cured, that the wounded Perſon would not be able to bend his Foot, but muſt ſupport himſelf chiefly upon his Toes.

(6.) When you make this Caſt of the Band, you muſt take care not to cover the Edge of the Foot; and for that Reaſon you may make the renverſed or reflected Turns, if you ſee convenient, to prevent the Bandage from preſſing upon the Bone on that Side.

(7.) As you aſcend upwards, you muſt make *Doloires*, in order to keep the Sole of the Foot ſteady and a little bent, and to faſten the Bandage, which terminates in the ſame Place where the other did before, which muſt be done by making renverſed and *Doloires*, either leſs or more cloſe, according as you find there is Occaſion.

After you have applied theſe Two Bands, you muſt have at Hand Two graduated circular Compreſſes: Theſe muſt be made Uſe of to make round the Member. You muſt make the Parts of theſe Compreſſes the more flat and the more thick, the nearer they are placed to the fleſhy Part of the Leg. This Compreſs muſt be applied in ſuch a Manner, that neither of its Edges may bear or preſs upon the interior Surface of the Leg, becauſe there it has no Fleſh.

This Compreſs renders the Part equal or even, and conſequently makes the Splints that are placed upon them to lie equal at their full Length.

The Splints muſt be made either of Paſtboard or elſe of very thin Wood; but the firſt are the beſt, together with ſimple long Compreſſes, which muſt be of a ſufficient Length.

If you make Uſe of wooden Splints, you muſt cover them with Linen or Thread on the Side which is to touch the Leg, that they may not prove troubleſome in preſſing upon the Part. If they are of Paſtboard, you muſt wrap them up in double Linen Cloths, without which, when they are moiſten'd, they will ſtick ſo cloſe to the Bands which are both upon and under them, that you will find it a hard Matter to get them off when you are to remove the Dreſſing.

We commonly wet the Paſtboard Splints, in order to make them the more pliable, and adapt them to the Figure of the Part, as alſo that they may give Way the eaſier to all the Bands that are to keep them ſteady, and that after they are dry they may be the more apt to retain the Figure that has been given them before.

Moſt commonly we apply Four Splints or longitudinal Compreſſes, ſo as to leave an Interval betwixt them, that they may extend and enlarge themſelves when the Band is tied over them, without turning into Pleats, which would make the Bandage unequal, and might prove incommodious to the Part; that is to ſay, you muſt adapt them in ſuch a Manner, as that they may occupy no more than the Circumference of the Part; for it is to be conſidered, that whilſt you are ſtreightening the Part by the Bandage, its Bulk is diminiſhed, and conſequently the Splints do approach nearer to one another, which they could not do if they did beforehand occupy the whole Circumference of the Part.

Theſe Splints or Compreſſes muſt not reſt upon the Shins, for fear of hurting them, becauſe they are not covered with Fleſh; for which Reaſon it is, that we never apply them to the interior Part of the *Tibia*.

Theſe Splints or Compreſſes ſerve to keep the fractured Bone, after its Reduction, in its Situation, ſuch as has been given it before, and to prevent the Part from bending in that Place where the Fracture is.

On the Fore-Arm we apply only Two Splints or long Compreſſes, becauſe it is flat, and therefore we put one on the Outſide, and the other on the Inſide, to keep the Two Bones of this Part aſunder, and to prevent their being conjoin'd together by the *Callus*. 'Tis upon this Account that I would adviſe you to apply them before the Firſt Band, *i. e.* immediately upon the Emplaſter, or the Firſt Compreſs.

The Third Band therefore ſerves to keep on the Splints and long Compreſſes. Some will have you apply the Extremities of theſe

Bands

Bands upon the Fracture on the Side that is oppoſite to that where the Ends of the other Two were placed; that is to ſay, that in caſe you have begun to roll the other Two from the Inſide outwards, you muſt roll theſe from the Outſide inwards; but I ſee no great Reaſon for this Caution, for you need only make Two or Three Rounds upon the ſame Rollings, or the Two Firſt, and after that aſcend by the *Doloires*: But I ſhould judge it much more convenient to deſcend to cover the Splints, and to bring it under the Sole of the Foot, in the ſame Manner as you do with the great Band; and for the ſame Reaſon you may go upwards again with the ſloaping Rollings or *Doloires*, which may be wider than thoſe of the Two preceding Bands, becauſe the Part has a greater Circumference. 'Tis alſo for this Reaſon that you make no Renverſes or Reflexions, and you let this Band terminate where the Two others do.

Over this Third Band you muſt apply a Fourth; and ſome would have you to begin to roll it from above, and where the others have their Beginning, and that on the oppoſite Side to the reſt, becauſe, ſay they, this will reduce the Muſcles to their true Station. But this ſeems to me a very weak Reaſon; for ſuppoſing the Muſcles to have been diſplaced, what Reaſon is there to imagine, that a Band applied over Three others, over the Splints and Compreſſes, ſhould reduce them into their proper Poſition? If any ſuch Thing was to be expected, you muſt certainly looſen the Firſt Bands. 'Tis doubtleſs alſo for the ſame Reaſon that they will have it applied from the Outſide inwards, and from below upwards; but in looſening the Two Firſt Bands, you act directly contrary to the Intention of the Bandage, which is to keep ſteady and firm the affected Part.

'Tis my Opinion, that this Band may be applied where the others end, and take the ſame Courſe, excepting that this muſt be roll'd from above downwards, to ſtop the Extremities of the Three Firſt Bands, which do terminate all Three in the ſame Places, and are not ſo very well faſten'd together.

However we may eaſily make Shift without this Band, if only we make the Third ſomewhat longer, and make the more *Doloires*, and to make them end by Two circular Turns below the Knee. You may alſo make this whole Bandage by the Means of One ſingle Band, provided it is of the ſame Length as all the Four others together: But the Miſchief is, that when the whole Length of all theſe Four Bands is brought into One Roller, it will be of ſo large a Bulk, as to be very troubleſome to manage it in thoſe Convolutions that are neceſſary to keep the Parts firm and in their due Poſition.

From what has been ſaid it is apparent that the Four Bands muſt not be all of the ſame Lenth; for the Second being to encompaſs a larger Circumference than the Firſt, becauſe the Part is made larger, muſt of Conſequence be of a greater Length.

The Third in Effect goes no further than the Second; but as the Bulk of the Part is encreaſed by the circular Compreſs, and by the Splints or long Compreſſes, ſo of Neceſſity it muſt alſo be longer; and the Fourth deſcending downwards, and aſcending upwards again to the Place where it had its Beginning, muſt be the longeſt of all the Four.

'Tis alſo manifeſt from hence, that both the Length and the Breadth of the Bands, Compreſſes, and of the Splints, muſt be proportionable to the Length and Thickneſs of the Parts.

Over all theſe Bandages you muſt put the Paſtboard-Splints. Some will have them not reach quite round the Part, but that they ſhould leave the anterior Part of the Tibia uncovered, becauſe, ſay they, it might injure or wound the Skin that does cover it; but this is a needleſs Precaution, ſeeing that this Part is too much quilted and ſecured by all the Bands that lie over it. But the true Reaſon why theſe Paſtboards are not placed cloſe together is, that they may keep the Parts the more equal and uniform together, juſt as we ſaid before of the wooden Splints; for were it not for that Reaſon, they might be exactly adapted to the Bulk or Circumference of the Part they were to encompaſs. This is done for another Reaſon alſo, to wit, that they may not ſtick to the Bandages, becauſe they are moiſten'd as well as the Splints; and 'tis upon that Account that the Paſtboards have Three ſmall Strings or Threads faſten'd to them.

This done, you put the Part betwixt the Junks, which are to ſurround the Leg and the Thigh, ſo as to render it but One rigid inflexible Piece. Theſe muſt not be all of an equal Length, for that which is to be applied upon the inward Part of the Thigh, or of the Leg, muſt be ſhorter on the ſuperior Part than the other, which is to be placed on the Outſide, for fear it ſhould wound the Manly Bag, the Groin, and the *Perone*. The Linen Cloths unto which they are faſten'd muſt alſo be ſlit aſunder in that Part, in order to accommodate it to the Figure of the Part. At the lower Part the Two Junks muſt come one as low as the other, and reach a little beyond the Sole of the Foot, in order to keep the Joint ſteady, that it may not move or ſtir from one Side to the other.

Before the Leg is placed upon the Junks, covered with the Linen Cloth, you muſt put a quilted Cuſhion, of the ſame Length with the Leg. At the Extremity of this Cuſhion they put a folded Cloth, with a Hole in the Middle, in order to apply it to the Feet.

This muſt be a little flat on that Part where it muſt touch upon the Tendon of *Achilles*; for if it were round, it might impair theſe Parts, for it ſerves for a Support to the Heel; and its Aperture or Hole, as well as its Thickneſs, muſt be proportionable to the Length and Bulk of that of the Heel, and it ſhould rather be ſomewhat thicker than thinner; and in caſe you find the Heel not ſufficiently raiſed, you muſt put a ſmall Compreſs upon this Cloth.

The affected Part being plac'd upon the quilted Cuſhion, you muſt apply the Junks, which muſt be roll'd up as much as is neceſſary to keep them upon the Sides of the Leg, and of the Thigh; but for fear they ſhould not reſt ſufficiently upon the Sides of the Sole of the Foot, which are not ſo much raiſed as the Heels, this Part muſt be provided with ſmall Compreſſes, by which Means the Junks keep the Sole of the Foot more ſteady, and that without the leaſt Danger of hurting it.

You muſt give Room to the Compreſſes as much as is requiſite, in that they may help the Junks, and prevent them from bearing upon the Ankles, or elſe upon the *Condyli* of the Thigh-Bone, and upon the *Head* of the *Perone*; wherefore you muſt put Compreſſes both above and below theſe Parts, for their better Security.

Laſtly, in caſe there are any Vacuities betwixt the Junks, you muſt ſtuff or fill them up with Compreſſes, that ſo they may be applied to and bear equally upon the Part through their whole Length. This done, you muſt cover the whole Inſide of the Leg with a long Compreſs made of a double Linen Cloth, and then tie the Junks with Four or Five Strings: But that you may not be obliged to lift up or move the affected Part when you are to convey theſe Strings underneath the Junks, you muſt lay them in due Order before you apply the Junks. Theſe Strings are always tied into Knots on the Outſide of the Thigh or Leg, this being the moſt commodious Place for the Chirurgeon.

Laſt of all, you muſt apply a Sole, either of Wood or Leather, which muſt be cover'd with a two or three-double Linen Cloth on that Side where it is to be put to the Sole of the Foot, that it may not hurt it. To the Middle of this Sole you muſt faſten Two ſmall String, to wit, one on each Side, and theſe Two Strings are tied together upon the Junks, by making Two Lozenges with them, which nevertheleſs is only for Faſhion-Sake.

Theſe Strings ſerve to keep the Leg ſteady, and conſequently the Sole of the Foot in a ſtreight Situation, and prevent the Foot from ſtirring or moving. Some add a Third String, to keep it the more ſteady: This they faſten to the Extremity of the Sole that lies next to the Toes, and then tie it to the String of the Junks which is immediately under the Knee. After all, you put a *Hoop* or Cradle, call'd the *Archer*, over the Foot, to prevent the Covertures or Bed-Clothes from preſſing upon the Leg.

I muſt not forget to put you in Mind, That the Bandages muſt neither be too ſtreight nor too looſe: The firſt, for Reaſons before-mentioned; and the laſt, that the Bands may not be looſen'd, and the Part diſcompoſed in its Situation. You may judge the next Day whether your Bandage is well managed, to wit, if the Part has remained in its right Poſition; if the Parts

that are below it are little ſwell'd, but without Pain, Tenſion, or Swelling of the Veſſels.

Neither muſt the Chirurgeon be negligent in putting his Patient into ſuch a Poſition as is ſuitable both to the Part and the wounded Perſon.

This Poſition of the Patient and of the affected Part is not always the ſame, but differs according to the Diverſity of the Parts; as for Inſtance, in the Fracture of the Thigh, the Patient muſt keep his Bed conſtantly, and that in the ſame Situation, till ſuch Time that the *Callus* is very well formed: The ſame Thing muſt alſo be obſerved with the utmoſt Exactneſs in the tranſverſe Fractures of the *Rotula*; for the *Aponeuroſis* of the *Muſculi Extenſores* of the Leg being very cloſely faſten'd to it, and that Part of this *Aponeuroſis* which has been torn in Pieces in the Fracture, having no other Stay than that Part of the *Rotula* unto which it is faſten'd, if the *Callus* be not well harden'd, the upper Piece will ſeparate from the other by the leaſt Streſs that is put upon it, and riſe upwards towards the Origination of theſe Muſcles, the whole Strength of which bears for the moſt Part upon this Piece when the Patient begins to walk. 'Tis upon this Score alſo that we never remove the Firſt Band till ſuch Time that the *Callus* is entirely formed and harden'd; for if the *Callus* be not well ſettled, the Pieces will come aſunder, and no Reunion is to be hoped for afterwards, as has been found by reiterated Experience; for in theſe People we ſee the *Rotula* to aſcend almoſt to the Middle of the Thigh in any ſtrong Extenſion of the Leg.

'Tis further obſervable, That theſe People do not walk lame, or upon Crutches, though ſome affirm the contrary. They only walk with ſome Difficulty where the Ground is rugged and uneven; and when they go up Hill, they are obliged to ſet the ſound Leg always foremoſt; and when they come down Hill, they muſt always keep it back.

'Tis alſo to be obſerved, that the *Aponeuroſis* of the *Extenſores* of the Leg, which covers the *Rotula*, may be torn in Pieces, and yet the *Rotula* may not be fractur'd, a Thing in which the moſt expert Chirurgeon may be deceived, becauſe the *Rotula* remains all that while in its natural Poſition.

The true Way to know whether the *Rotula* be torn aſunder is, to fix your Thumb upon the ſuperior Part of the *Rotula*, and then make the Patient extend his Leg: You will then find the *Aponeuroſis* to move from thence upwards, and to leave a Hollowneſs under your Thumb.

In the Fractures of the Leg or of the Thigh, the Patient muſt lie upon his Back, with his Head almoſt as low as his Feet, that the Body may not in the leaſt reſt upon the Heel; and the Foot of the fractured Part ought to be raiſed a little higher.

On the contrary, in the Fractures of the Arm, the Patient may walk about; but he muſt not make Uſe of the broken Arm, ſo as to move it, or at leaſt not before the *Callus* is form'd.

In the Fractures of the Thigh, of the *Rotula*, or the Leg, and of the Foot, the Knee muſt be always kept extended; whereas the Elbow muſt be kept bended a little, and therefore muſt be put into a Scarf.

The ſame Thing muſt be obſerved in all the Fractures of the Arm, the Cubit, of the Hand, of the Shoulder, and of the Clavicle, becauſe too much Extenſion is not ſo natural to the Elbow as Flexion, and the laſt is much leſs troubleſom to the Elbow than the firſt.

Firſt then you muſt ſupport the Cubit by Means of a Scarf, to prevent its drawing the Arm downwards; and that it may be ſuſtained with the leſs Inconveniency, you muſt keep it in a bended Poſture.

Secondly, it is much leſs incommodious to the Patient in that Situation than if it were extended. But you muſt obſerve, that in the Fracture of the *Clavicula*, the Elbow muſt be kept a little backwards; but in the Fracture of the *Shoulder*, a little forwards.

The Elbow muſt be kept forwards in the Fracture of the *Clavicula*, that ſo the Arm, by drawing the *Omoplata* backwards, that Part of the *Clavicula* which is faſten'd to it may be alſo brought backwards, and conſequently may not ſlip under the other: But this Poſition is required only when the Clavicle is fractur'd croſswiſe, horizontally, or obliquely; for when the Fracture is made

made lengthways, there is no Occaſion for it.

The contrary is to be obſerved in the Fracture of the *Omoplata*, becauſe in that Poſition its Muſcles lie flat and cloſe together like Splints; for the reſt, the *Omoplata* being much broader, its Pieces cannot ſlip one over the other.

A Chirurgeon muſt have a due Regard to theſe different Poſitions; for before he applies the Bandage, he muſt put the Part into ſuch a Situation as he would have it remain in afterwards; for without this Precaution, the Bandage will either prove too ſtreight or elſe too looſe, if he would pretend to give it its Situation after the Bandage is applied.

In the Fracture of the Thigh or of the Leg, a Chirurgeon muſt have a ſingular Regard to the Heel, that it may not lie hollow, nor reſt upon ſomething that is hard, becauſe it will excoriate, and exulcerate at the Tendon of *Achilles*, and be attended with pernicious Symptoms.

The ſame Regard muſt be had to the *Olecranon*, in the Fractures of the Arm, and the Fore-Arm, *&c.* In the laſt of theſe you muſt take Care, that the Wriſt of the Hand do reſt upon ſomething; and in both of them the Part muſt reſt at its whole Length upon ſomething that is ſoft and eaſie, and that in ſuch a Manner, that it may be dreſs'd eaſily, without either changing or ſtirring the Situation of the Part.

All Sorts of Motions being contrary to the Reunion of Fractures, a Chirurgeon ought to dreſs the Patient as ſeldom as may be. He ought not to remove the Dreſſings till the Seventh, Eighth, or Ninth Day, or not at all, unleſs the Patient be troubled with exceſſive gnawing Pains in the Part, or that the inferior Parts are much tumefied or extended, *&c.* and after that he muſt dreſs it oftener or ſeldomer, according as he ſhall judge it abſolutely neceſſary at each Dreſſing.

Let Two of his Aſſiſtants take the Part by the Two Extremities of the broken Bone, in order to lift it up gently at the ſame Time, and let each of them at once draw it a little towards him as ſtreight as poſſibly may be, ſo that the Part may not bend either one Way or the other, no more than the Prominencies or Inequalities, which might prick the adjacent Parts. That you may lift up the affected Part with the more Eaſe, and in a direct Line, let the Chirurgeon, with the Help of his Two Aſſiſtants, take Hold of it, and lift it up at the Place where the Fracture is; and the Aſſiſtants muſt keep it in that Situation, without ſtirring it as little as poſſibly may be, whilſt the Chirurgeon takes off the old Dreſſing, and puts on the new; and as this requires ſome conſiderable Time, his Aſſiſtants muſt be both underſtanding and robuſt. The Chirurgeon muſt manage the Part with all poſſible Gentleneſs, without ſtirring or ſhaking it; for which Reaſon he muſt with one Hand ſuſtain the Place where the Fracture is, whilſt with the other he unties and reſiſts the Bandage, and change his Hand alternatively.

The affected Part he muſt foment with aromatick Wine, a little warm'd, which will cleanſe it of the Filth and Excrements that gather thereabouts, and which cauſe a Corroſion and Ulceration of the Skin. If the Chirurgeon finds a ſlight Excoriation in the Skin, he may moiſten his Firſt Band in Lime-Water; if a ſlender Inflammation, he may make Uſe of a Defenſive, and bathe it with *Oleum Roſatum*, and a little Spirit of Wine; and if it is free from all Symptoms, he need only dip all his Compreſſes in *Oxycrate*, or in the aromatick Spirit of Wine.

Laſtly, we cannot ſufficiently recommend, as well to the young Chirurgeon, as to the wounded Perſon, to keep the fractur'd Part very quiet, there being not any Thing that is more detrimental to the Reunion than Motion or Stirring, whether occaſion'd by the Chirurgeon or by the Patient: And it happens very often, that by ſtirring the Fracture, each of the Extremities of the broken Bone grows dry, and becomes callous; as may be obſerved in the following Inſtance:

'A certain Perſon happened by a Fall to 'break his Left Arm, about Four Inches 'above the Wriſt, ſo that both the Bones, 'to wit, the *Radius* and the *Ulna*, were fra-'ctured croſswiſe, and entirely ſeparated. 'A Chirurgeon being call'd to his Aſſiſtance, 'to ſet the broken Bones; the Perſon up-

'on his Coming would not ſuffer himſelf 'to be touch'd by him, imagining that it 'would reunite without any Bandage; and 'inſtead of keeping his Arm ſteady and 'quiet, he conſtantly moved it, and was 'ſo far accuſtom'd to it in Time, that 'he went and uſed it about his ordina-'ry Affairs. To be ſhort, he made Uſe of 'the ſame Arm and Hand as much as poſ-'ſibly he was able; ſo that in Proceſs of 'Time he could with his Right Hand bend 'both, and turn out and inwards the Fore-'Arm at the very Place of the Fracture.

Fabricius Hildanus has left us an Inſtance very near of the ſame Nature, in his Third Century, in the 31ſt Obſervation.

'A certain young Phyſician having ſeen 'One of theſe Two Bones in the Room 'where the Skeletons are kept in the Royal 'Garden, did imagine that a new Articula-'tion had been made in the Place of this 'Fracture, and that conſequently the before-'mentioned Perſon could bend his Fore-'Arm in Two Places: Upon which he fra-'med a new Syſtem, which, together with 'the Draught of the Bone, and his own 'Obſervations upon it, he communicated 'to Mr. *Bayle*, who has inſerted them in the 'Journal publiſhed in *Holland*: But his Re-'flexions and Deductions are very erro-'neous, there being a vaſt Difference be-'twixt a Fracture and an Articulation of 'a Bone.

Some further Remarks upon FRACTURES.

When the Extremities of the broken Bones are become callous, if it be not too late, you muſt rub theſe Two Extremities one againſt another, by which Means you may rub off the *Callus*, and by opening thus a free Paſſage in the ſmall *oſſeous* Pipes, or *Tubuli*, make Way for a freſh Supply of nutritious Juice, which, by producing a new *Callus*, furthers the Reunion of the broken Bones: But in caſe it be an old *Calloſity*, ſome Practiſers adviſe to make Two longitudinal Inciſions on the Sides of the Fracture, in order to lay open the *Callus*, and bring it to an Exfoliation. But if the Caſe is ſuch, as in the before-mentioned Inſtance, *i. e.* without any great Inconveniency, or that it happens in the Arm, or in the Fore-Arm, I would rather adviſe you not to meddle with it, than to make Uſe of theſe Inciſions, which to me appear both uncertain and dangerous, and therefore ought not to be put in Practice, but in Caſes of an abſolute Neceſſity; as if, for Inſtance, ſuch a Calloſity ſhould happen after the Fracture of the Leg, or of the Thigh, becauſe theſe Parts being the true and only Support of the whole Body, require a great deal of Strength and Firmneſs.

Sometimes a certain purulent Matter, or of ſome other Nature, gathers betwixt the Extremities of the fractured Bones, as may be ſeen by the following Inſtance:

'A certain Perſon happened to break 'both the Bones of his Leg: One of theſe 'Bones having pierced through the Fleſh 'and Skin, a great Suppuration enſued in 'that Part, and the Matter being ſtop'd be-'twixt the Two Extremities of the Bones, 'by Reaſon of ſome Neglect in the Dreſ-'ſings, the Part being not well managed 'with the Bandages, the Two Bones were 'not kept ſteady, which prevented the ſet-'tling of the *Callus*, and conſequently the 'Conſolidation of the Bones. Not long 'after, when the Wound was well near 'healed up, they ſaw themſelves obliged to 'dilate the Aperture or Orifice, to promote 'the Exfoliation of the Two Extremities of 'the Two Bones. The Exfoliation being 'accompliſhed, the Fracture was reduced, 'and in a little Time after the wounded 'Perſon could uſe his Leg as well as be-'fore.

It happens ſometimes, either by the Neglect of the Chirurgeon, or of the Patient, that the Extremities of the Bones are reunited in ſuch a Manner, as to ſtand one over another, or as to make an Angle, or to go acroſs one another. In ſuch-like Caſes, if it be a freſh *Callus*, you may break it again by a violent Extenſion or other Motion, and ſtirring it on all Sides. If it be accompanied with a Wound, ſo that you cannot break it by ſtirring, you muſt dilate the Wound, lay open the conſolidated Bone, and procure the Exfoliation of the *Callus*. Some Practiſers adviſe the breaking of the Part by Means of divers Engines; but theſe are

are Remedies of ſuch a Nature, as moſt frequently prove dangerous to the Patient; for it happens very often that the Part breaks aſunder in another Place. 'Tis therefore more adviſeable to reſt contented with ſome Deformity in the fractured Part, than to endanger the Patient's Life, and that without any Certainty of mending the Matter, or redreſſing the Deformity.

It happens frequently in the oblique Fractures, and eſpecially in thoſe of the Thigh, that the Extremities of the Bones do ſlip one over another, and thus are reunited together, which makes the Part much ſhorter than it was before. This Deformity may be remedied, if you take it in Time, whilſt the *Callus* is as yet forming: And 'tis upon this Account that as often as the Chirurgeon does dreſs it, he ought to take peculiar Notice, whether the Part keeps its natural Figure and Length, that ſo, in caſe he finds it to be ſhort, crooked, or turn'd acroſs, he may endeavour its immediate Reduction, either by Extenſion, or other Motions proportionable to the Hardneſs of the *Callus*.

Before we conclude this Head, we muſt add a Word or Two concerning the Nature of the *Callus*, and the Time of its Formation.

The *Callus* is nothing elſe than the nutritious Juice of the Bone, which iſſues forth out of the Extremities of the Fibres of each End of the bone, which gathering and coagulating inſenſibly, ſerves inſtead of a Cement to produce a very compact Reunion of the Extremities of the broken Bones.

The *Callus* has the ſame Subſtance as the Bones have, and differs from them only in their Configuration. In the Bone the Fibres are altogether diſpoſed and extended according to the Length of the Bone; whereas in the *Callus* you ſee nothing elſe but a homogeneous Matter, which is diſpoſed leſs or more irregular, according to the Diſpoſition of the adjacent Parts, and according as you take more or leſs Care to keep it within Compaſs.

But notwithſtanding all this, though the Fracture be reduced, and the Place where the Bone is broken be kept very cloſe and even, there will always appear a ſmall Prominency round the Circumference of it.

As to the exact Time of the Formation of the *Callus*, it is ſcarce to be determined, no more than that of the Exfoliation of the Bones; but generally ſpeaking, it is formed ſooner in thoſe Bones that are of a ſpongeous Subſtance, than in thoſe that are very compact; and ſooner in young than in very old Perſons. To be ſhort, it is with the Time of the Formation of the *Callus* the ſame as with that of the Exfoliation of the Bones.

Some have endeavoured to promote the Formation of the *Callus* by the Uſe of Calves and Mutton Feet. 'Tis true, they make a Sort of Size or Glue of ſuch Kind of Things, wherewith the Workmen unite and conglutinate their Pieces of Workmanſhip; but from thence no Inference is to be made, that theſe Things taken inwardly produce the ſame Effects. Thus they repreſent the *Lapis Oſteocellæ* as a grand Specifick for the Formation of the *Callus*; but in my Opinion there is no great Streſs to be laid upon this Remedy, no more than upon Sheeps-Trotters and Calves-Feet.

The *Callus* is a pure Work or Operation of Nature, and therefore we have nothing elſe to do but to give her a helping Hand, partly by a regular Way of Living, partly by a ſuitable Diet, by Aliments of good Nouriſhment, and by correcting or diverting, by the Means of proper Remedies, every Thing that is capable of diſturbing this Work.

To anſwer theſe Ends, you muſt rub the Places of the Fracture with the aromatick Wine, and with Spirit of Wine mix'd with a Third Part of the Spirit of Earth-Worms: In order to help the drying of the *Callus*, when it is already pretty well advanced, you may rub it frequently, but gently, with Linen Cloths, which muſt be moderately warm.

When the *Callus* begins to grow ſtrong, you muſt often but gently ſtir the Part, for fear of an *Enchyloſis* in the Joint; but whenever you make theſe Motions in the Part, you muſt keep it very firm and ſteady in that Place where the Fracture is, for fear of breaking the *Callus*.

'Tis further to be obſerved, that the tranſverſe Fractures of the Thigh may be retain'd

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in their Poſition by a ſimple Bandage; but when they are made obliquely or ſloaping, the Bandages alone are not ſufficient to keep them in their Situation, becauſe the Two Extremities of the Bone will ſtand one over the other. To remedy this you muſt, after you have applied the Band as is uſual in ſuch Caſes, take a Napkin, which muſt neither be too hard, nor too weak or ſlender: This you muſt tie double together, and put it betwixt the Patient's Thighs, ſo as that its Middle may bear exactly upon the *Os Pubis*, on the Side of the Cods; but to take Care that the *Scrotum* be not taken within the Napkin, the Ends whereof muſt be ſtretch'd upwards, and faſten'd to a Nail fix'd within a Board on the Side of the Bed. This prevents the Body from deſcending downwards, and conſequently the ſuperior Part of the broken Bone from falling upon the other. You muſt not neglect to change the Napkin, and to put it ſometimes on one a nd ſometimes on the other Side of the manly Bag, for fear of excoriating the Part, and introducing a Gangrene: But after all, the Napkin muſt be ſo managed as to ſuſtain the Body.

It often happens, that after you have made ſufficient Proviſion againſt the deſcending of the ſuperior Part upon the inferior, you muſt alſo take effectual Care, that by the Contraction of the Muſcles, the inferior Part be not forced upwards, ſo as to aſcend over the ſuperior Part of the broken Bone. To prevent this, you muſt apply a pretty thick Compreſs round the inferior Part of the *Femur*, above the Knee, and ſew a Kind of a Splint upon it, ſo that each of the Two Extremities of theſe Splints do reach down on the Sides of the Leg, in order to be faſten'd unto Two Nails, which muſt be fix'd in a Board at the Feet of the Bed. You muſt proceed in the ſame Manner with another Compreſs, to be applied to the interior Part of the Leg, above the Joint of the Foot, either to looſen or ſtreighten the Splints above, and ſometimes that below, alternatively, to prevent the Excoriation of either Part: But if by Chance the Part does excoriate, you may apply to it the *Emplaſtrum Diapalma*, diſſolved in the *Oleum Roſat.* or in warm Water.

You muſt take Care likewiſe to keep the Foot of the wounded Perſon in a Caſe, to prevent its falling on one Side or the other.

If you intend to be ſatisfied whether the Bone is well conjoin'd or reunited, you muſt meaſure the broken Leg with that which is ſound, to try whether they be alike; but take Care you be not miſtaken in this Point, becauſe ſometimes the Patient may hold the ſound Leg ſomewhat ſhorter; but your beſt Way is to compare the Heels and the Two *Rotulæ*, which are Two infallible Marks; as alſo in the Fractures of the Thighs, if the Patient will keep his Body upright or ſtreight, you muſt compare the Two *Rotulæ* together.

If there be a ſloaping Fracture in the *Humerus*, you muſt make Uſe of the Bandage with many *Chiefs*, which will come round the Body of the Bone, without ſtirring or diſcompoſing the Part.

'Tis obſervable in the Fractures of the *Radius*, that the Two broken Ends will incline towards the *Cubitus*; Firſt, becauſe the Blow, which is the ordinary Cauſe of the Fracture of this Part, does preſs them inwards: Secondly, becauſe the Two Muſcles which ſerve for the Pronation, are much ſtronger than thoſe that are deſigned for the Supination; and 'tis ſufficiently evident, that we are much more inclinable to make the Pronation than the Supination: So that the Muſcles draw the Two Ends towards the *Cubitus*, and the *Aponeuroſis* which is betwixt the Two Bones prevents them from going outwards; for when the *Radius* is broken in the Middle, the *Muſculus Quadratus* in his Action draws the inferior Extremity, and the *Muſculus Rotundus* the ſuperior End towards the *Cubitus*: So that the only Way to know and reduce this Fracture, is to be aſſiſtant to the Patient in making the Motion of Supination.

After you have thus reduced the Fracture, you muſt have at Hand Two Compreſſes, one of which muſt be much thicker at one End than at the other, and the other need not be quite ſo thick. The thickeſt of the Two Compreſſes you muſt apply to the Inſide of the Fore-Arm, ſo as to bring the thickeſt End below, and the other on the Outſide, likewiſe with the thickeſt End

down

downwards. This Bandage muſt be made quite contrary to that which is practiſed in other Fractures, becauſe with this you muſt not begin upon the Place of the Fracture, but at the inferior Part of the Bone, and make it pretty ſtreight in the Beginning.

When you come upon the Place of the Fracture, you muſt not preſs ſo hard, and ſo with the reſt.

To diſtinguiſh the Fracture of the Fore-Arm, you muſt oblige the Patient to make the Motion of Flexion and Extenſion; and you may apply the Firſt Circumvolution of the Band to the very Place of the Fracture.

In the Fractures of the Ribs, the Extremities of the broken Bones commonly are ſtruck inwards. If you intend to reduce them to their natural Poſition, you muſt preſs them with your Hands on the Sides, juſt as when we take Hold of a Bow near the Ends, the middle Part will riſe upwards. To keep the Bone in its Situation, you muſt be provided with Two thick Compreſſes, one of which you muſt apply to the End that is faſten'd to the *Sternum*, and the other to that Extremity which is articulated with the *Vertebra*, and keep them depreſs'd very ſtrong, without putting any Thing upon the Place of the Fracture.

In the Fracture of the inferior Mandible, after you have ſet the Bone in its natural Poſition, the beſt Way to keep the Bone ſteady is to put it into a Leaden Caſe, ſhaped exactly like the inferior Mandible; but if the Fracture be attended with a Wound, I adviſe you to have one made of a Tin Plate, in which you muſt have a Hole, by the Help whereof you may the better dreſs the Wound; but if there be no Wound, you need only dip a Kind of Paſtboard Splint, wrapp'd about with Linen, in the White of an Egg, beaten up with a little *Sal Armoniac*: But before you lay on this Defenſative, you muſt apply a Piece of Linen Cloth betwixt it and the Skin, that it may not prove hurtful to the Part; for it will become hard, and of the ſame Figure with the Mandible, and conſequently will keep it in its proper Situation.

The Fractures of the Clavicle are very difficult to be retained, becauſe when the Clavicle is not broken, the Two pectoral Muſcles and the *Trapezii*, with the *Rhomboides*, are in an *Equilibrium*; but when the Clavicle is fractured, the *Pectorales* get the better of their *Antagoniſts*. Thus they draw forwards the *Omoplata*, which is moveable, and conſequently the Extremity of the Clavicle, which is fixed to the *Acromion*, will riſe over the other. To prevent this, they make Uſe of an Engine, which keeps the Arm backwards. It is made almoſt in the ſame Manner as the Croſſes are, which we make Uſe of to keep the little Children upright.

If you are to ſet a fractured *Rotula*, let the Patient be ſeated upon a Chair, with his Foot fix'd againſt the Ground. The Chirurgeon muſt preſs hard upon that half Part of the *Rotula* which is raiſed up to the Thigh, and afterwards you muſt keep it together with a Bandage.

Some, when they are obliged to make Uſe of the Bandage with Eighteen Chiefs, put over the Emplaſter a waxed Piece of Taffeta Silk, to prevent the Matter from ſpoiling the Bandage, that they need not change it ſo often. Some alſo make Uſe of Spunges, which ſuck in the purulent Matter, which elſe ſpoil the Linen Bands.

Of the FRACTURES *of the other Bones belonging to the Humane Body. Taken out of Monſieur* de St. Hilaire's *Anatomy*, &c.

Of the Fracture of the NOSE.

A Fracture of the Noſe is always cauſed by ſome moſt violent Shock or Blow. Its Signs are, a Depreſſion or Falling in, a Diſtortion and Diſfigurement of the Noſe. If you reduce or ſet it again, it is attended with ſordid Ulcers, and Excreſcencies of the Fleſh, which oftentimes do degenerate into an incurable *Polypus* of the Noſe. You cannot breath through the Noſe but with much Difficulty, and commonly loſe your Smelling.

Of

Of the Fracture of the LOWER JAW-BONE.

'Tis much more dangerous when you find the inferior Jaw-Bone fractured in its Angle, than when it happens at its *Baſis*, becauſe in the Angles of the inferior Jaw-Bone ſeveral Veſſels take their Paſſage; and the Tendon of the Muſcle *Crotaphites* being faſten'd there, this produces Convulſions, Obſtructions, and ſometimes Ulcers, and ſometimes ends in Death it ſelf.

Of the Fracture of the CLAVICLE.

If there happens a compleat Fracture of the *Clavicle*, *i. e.* if it be quite broken, the Extremity which is faſten'd to the *Acromium* deſcends with the *Omoplata*, being carried downwards by the Weight of the Arm.

If it is broken athwart, you will feel a pricking and acute Pain in that Part. If the Clavicle be ſplit or crack'd lengthways, it will appear bigger than it ought to be, which you may ſoon diſcern by comparing it with the ſound Clavicle.

Of the Fracture of the OMOPLATA.

In caſe the *Omoplata* is fractured in the Middle of the Bone, which is very thin in that Part, it gives Way when you preſs upon it with your Thumb; and you will obſerve a great Swelling in the Arm, by Reaſon of the Nerves that diſperſe themſelves through the Muſcles of that Part.

If the *Omoplata* is fractured near the Cavity *Glenoide*, it is of very dangerous Conſequence, by reaſon of the axillary Veins and Arteries, and the Nerves that take their Paſſage that Way.

Of the Fractures of the RIBS.

The upper Ribs being harder and more brittle than the lower Ribs, are conſequently more ſubject to Fractures; whereas the others being much more tender, are apt to be bent inwards, ſometimes without being fractured.

When a Rib is quite broken aſunder, ſometimes its Extremities are turn'd inwards towards the Breaſt; but ſometimes they jet outwards, and ſometimes alſo theſe Extremities remain in their natural Poſition.

When the Extremity of a broken Rib ſtretches inwards, it cauſes a Compreſſion upon and tears aſunder the *Pleura*, and ſometimes alſo the Lungs themſelves, all which occaſions moſt exquiſite Pains, and continual Prickings; the Patient breathes not without a great deal of Difficulty, and not without Pain, ſpits Blood, and a Fever enſues.

If the Extremities of the fractured Rib does jet outwards, you may diſcover a Prominency at the Part; but if the Two Extremities of the ſame broken Bone remain in their Poſition, ſtanding one cloſe to another, then none of the before-mention'd Symptoms do appear; but you may diſcover the Fracture by a crackling Noiſe, if you preſs your Thumb againſt the affected Part.

Of the Fracture of the STERNUM.

The Signs by which you may diſcover the Fracture of the *Sternum* are, a Depreſſion or Falling in of the Part; a Palpitation of the Heart; Difficulty of Reſpiration; a Phrenſy, and ſometimes Spitting of Blood. Theſe Symptoms are occaſioned by the Compreſſion of the *Mediaſtinum*, of the Heart, of the Lungs, of the Nerves, and of the Veſſels.

Of the Fracture of the VERTEBRÆ

The Signs by which we diſcover the Fractures of the *Vertebræ* of the Neck and of the Back are, the Arm is affected with a Palſy and Benummedneſs; the Patient alſo ſuffers an involuntary Excretion of the Excrements; and ſometimes he is troubled alſo with a Suppreſſion of Urine.

The Fractures of the Bodies of the *Vertebræ* are exceeding dangerous, becauſe in theſe Caſes the Marrow of the Spine, which gives Origination to all the Nerves, is impaired. The Fractures that happen to the *Apophyſes* of the Spine are not altogether ſo dangerous as thoſe that befal their Bodies, becauſe they do not hurt the Spinal Marrow.

Of the Fracture of the Coccyx.

The Signs of a Fracture of the *Coccyx* are, a Suppreſſion of the Excrements, and ſometimes alſo a Palſy of the *Sphincter*, which comes from thence, That the *Coccyx* being depreſſed inwards by ſome Fall, it produces a Compreſſion upon the *Inteſtinum Rectum*, and the *Sphincter*, as alſo an exceſſive Pain.

Of the Fracture of the Os Ilium.

The Signs by which you may diſcover a Fracture in the *Os Ilium* are, a Swelling of the Thigh to the very Leg on that Side where the Fracture was made, becauſe the nervous Parts are affected here.

DIRECTIONS *for the Dreſſings of* Fractured Bones.

By Monſieur Le Clerc, *Phyſician in Ordinary to the preſent* French *King; abridg'd from the Original.*

The Dreſſing for a Fracture in the Bones of the Wriſt.

Firſt, a Band with One Head, of Six Ells in Length, and an Inch and a half in Breadth. With the End of it make Three Turns round the Wriſt; carry it between the Thumb and Fore-Finger, ſo as to make an X on the Bottom of the Thumb, and then make Edgings to cover it.

Secondly, a Compreſs of Linen doubled ſeveral Times together, and of the Figure of the upper Part of the Hand, and ſufficiently large to cover the Wriſt. Dip it in *Oxycrate*, and then apply it to the Wriſt, with the narrow End towards the Fore-Arm.

Thirdly, a Paſtboard of the ſame Figure with the former Compreſs, and another Compreſs to be laid over it:

Then carry the Remainder of the Band over this Compreſs and Paſtboard; run upwards with Edgings the whole Length of the Fore-Arm, and faſten the Band with Turnings above the Elbow, and pin; and then put the Arm in a Scarf.

The Dreſſing for a Fracture of the Metacarpus.

Firſt, a Band with One Head, of an Inch and a half in Breadth, wherewith to make Two circular Turns about the Wriſt, and then bringing it over the *Metacarpus* betwixt the Thumb and Fore-Finger, ſo as to make an X on the Hand. You muſt continue to make Edgings and X's on the Hand till it be quite covered.

Secondly, a Compreſs of Linen Cloth doubled together ſeveral Times, of the Shape of the upper Part of the Hand, ſo as to cover the *Metacarpus*, to be applied over the Roller.

Thirdly, a Paſtboard of the ſame Shape, with the Compreſs to be laid over it.

Fourthly, a Compreſs of the ſame Figure with the former, and another of the ſame Sort, both to be laid one over the other on the Inſide of the Hand: After which, with the Remainder of the Band, make Edgings both over and in the Hand, and with the ſame Edgings run up the whole Length of the Fore-Arm, and after ſeveral circular Turns, faſten it above the Elbow, without covering it, and cauſe the Arm to be carried in a Scarf made of a Napkin, Piece of Linen Cloth, or of Silk, as has been ſaid before.

The Dreſſing for a Diſlocation of the Firſt Set or Rank of Bones of the Fingers *from the* Metacarpus.

Here ſuppoſing the Firſt Bone of the Thumb to have ſuffered a Luxation, you muſt with a Roller of about half an Ell in Length, and Two Thirds of an Inch in Breadth, make Two Turns round the Wriſt, and then paſſing over the Joint of the Thumb, turn there ſo as to make an X on the Joint; then bring the Roller down to the Wriſt again over the Firſt Round, and thus make a Second X, with a ſmall Edging. Continue to do thus with X's and Edgings till you come near the End of your Band, and then with the Remainder make

Two circular Turns about the Wriſt, where you muſt faſten it.

This ſmall Bandage is call'd the *Spica*, and ſerves for all the Firſt Range or Set of the Fingers.

But as for the Range, ſuppoſe the laſt or upper Bone of the Middle-Finger to be diſlocated, you muſt make Turns about the Wriſt as before; then carry the narrow Band over the Hand quite to the diſlocated Bone, whilſt the Patient keeps his Hand open; make a Round about the luxated Bone; then by ſmall Edgings run all along the Finger down to the Wriſt, where you may terminate the Bandage with ſeveral circular Turns, and faſten it.

The Dreſſing for the Fracture of the Breaſt-Bone.

Firſt, a Compreſs of the ſame Figure with the *Sternum*, doubled ſeveral Times together, to be dipp'd firſt in ſome proper Liquids, and then to be laid immediately upon the affected Part.

Secondly, a Paſtboard ſhaped after the ſame Figure as the Compreſs and Breaſt-Bone. This muſt alſo be dipp'd in ſome Liquor, to ſoften and make it pliable, and then it is to be applied to the *Sternum* upon the Compreſs.

Thirdly, a large Napkin to be folded in Three Parts, and roll'd at both Ends. The middle Part is to be applied to the Breaſt-Bone, and the Two Heads, being firſt turn'd behind, be brought before again, and then faſten'd with Pins.

Fourthly, the *Scapulary* is a Piece of Linen Cloth, of about a Yard in Length, and no leſs than Six or Seven Inches in Breadth, having a Slit or Aperture in its Middle to put the Head through, ſo that one of its Ends may come before, and the other behind. Unto this the Napkin or Breaſt-Bandage is to be faſten'd, either by ſlitting the Ends of the Napkin, and then croſſing them, to pin them at ſome Diſtance from each other; or elſe by putting the Ends of the *Scapulary* under the Napkin, and then turning them up to pin them.

The Dreſſing for the Fractures of the Ribs.

Firſt, an oblong Compreſs of the Breadth of an Inch and a half to be doubled together ſeveral Times, and applied lengthways to the broken Ribs. If more Ribs are fractured, it muſt be broad enough to cover them all.

Secondly, Two ſmall Paſtboards to be applied, croſſing each other in the Middle, in the Form of a St. *Andrew*'s Croſs, upon the Fracture.

Thirdly, a pretty large Compreſs, to be doubled together ſeveral Times, to be laid over the whole Dreſſings.

Fourthly, a Paſtboard to be applied over the Compreſs.

Fifthly, another Compreſs of Linen, doubled together ſeveral Times, to be laid on the aforeſaid Paſtboard.

Sixthly, a large Napkin, laid together in Three Folds or Leaves, and roll'd at both Ends, to be applied about the *Thorax*, to keep on the Dreſſings in ſuch a Manner as has been related before in the Dreſſings of the Fractures of the *Sternum*.

Seventhly, the Bandage call'd the *Scapulary*, with its one Part before, and the other behind, unto which the Napkin is to be faſten'd in ſuch a Manner as has been related before in the Fracture of the Breaſt-Bone.

The Dreſſing for the Fractures of the Spinal Proceſſes of the Vertebræ.

Firſt, an oblong Compreſs of Linen, doubled ſeveral Times together, of about an Inch in Breadth, to be applied along the *Vertebræ*, on the Side of the Spinal Proceſs which is fractured, after its Reduction.

Secondly, a Paſtboard of the ſame Figure and Length as the Compreſs, to be applied lengthways over all.

Thirdly, a ſmall longiſh Compreſs, in ſeveral Doubles of the ſame Bigneſs and Figure as the Firſt, which is to be laid over the Paſtboard.

Fourthly,

Fourthly, a ſmall longiſh Compreſs in ſeveral Doubles, to lay on the other Side of the fractured Spine, to keep it up.

Fifthly, a Paſtboard laid over the Compreſs.

Sixthly, a ſmall longiſh Compreſs to lay over the Paſtboard.

Seventhly, a large Napkin of a good ſoft Cloth, folded in Three Leaves, roll'd up at both Ends, to be brought round the Body, as deſcrib'd in the Dreſſing for the Cancer.

The Dreſſing for the Empyema.

The Operation is an Aperture made between Two Ribs, to let out the *Pus*. The Dreſſings are as follow:

Firſt, make a Tent of ſoft Lint, to be introduced into the Wound after the Operation. This Tent muſt be ſhort, for fear of hurting the Lungs, and blunted at the End: It muſt be capp'd too, to prevent it from ſlipping into the Breaſt, and tied with a good Thread, which muſt hang out of the Wound, for the drawing it out if it ſhould happen to ſlip into the Breaſt. For the more handſome making this Tent, cut ſeveral Bits of Cloth of an Inch and half ſquare: Take one of theſe Pieces by one of their Angles, and make a little Roll between the Thumb and Fore-Finger, and let this Roll be brought to a Point at one End, and be bigger at the other: Roll a Second Piece over this, as you did the Firſt, and then a Third, and ſo on till your Tent be big enough, and then tie it: Cut the big End with the Siſſars, and after cut it lengthways for the Space of an Inch: Separate to the Right and the Left what you have cut, and form a Head, and then ſhape it round with your Siſſars. Take care to blunt your Tent at the ſmall End, and to ſoften it by rubbing and managing it with your Fingers. Some Practitioners prefer a large thick Tent made of Lint, and thruſt this armed with a Digeſtive into the Wound.

Secondly, make Pledgets to lay on the Wound.

Thirdly, an Emplaſter to cover theſe Pledgets.

Fourthly, a thick Compreſs in ſeveral Doubles, to cover the Dreſſings.

Fifthly, a large Napkin, folded in Three Leaves, to be brought round the Breaſt, to keep on the Dreſſings. If the Lungs make an Effort to get out of the Aperture, put them back with a hollow blunt Probe, or a Pipe, through which the Matter may flow out. When the Patient is dreſs'd, place him in his Bed half erect, and when he feels a Weight, take off the Dreſſing, to let out the Matter which preſſes on the Diaphragm.

The Dreſſing for a Diſlocation of the Vertebræ.

Firſt, make Uſe of Two ſmall Plates of Lead, to be placed lengthways on the Body of the *Vertebræ* which is luxated, one on each Side of the Spinal Proceſs, after the Reduction.

Secondly, Two long Compreſſes of Linen Rags, in ſeveral Doubles, to be laid on each Side of the Spinal Proceſs, over the Plates of Lead.

Thirdly, a large Compreſs laid over all this muſt have ſeveral Doubles.

Fourthly, a large Napkin, folded in Three Leaves, to embrace the Breaſt; of which before this muſt be pretty ſtreight.

The Dreſſing for the Paracenteſis.

The *Paracenteſis* is an Aperture in the *Abdomen* of Hydropical People, made with the Lancet or *Trocar*. The Dreſſings are theſe:

Firſt, a large ſquare Compreſs in Eight Doubles, to be applied on the Puncture made with the *Trocar*, to hinder the Waters from flowing out; for however the Aperture be very ſmall, the Waters will tranſude through it, and ſo foul the Bed, without this Caution.

When you have made the Puncture with the Lancet, and would draw the Waters out at ſeveral Times, leave the Pipe in the Wound, or ſtop it with a Tent, and lay a Compreſs over it.

Secondly, uſe a large Napkin, folded in Three Leaves, to be roll'd round the Belly, to keep up the Dreſſings as before.

Dreſſings which may ſerve for all Accidents on the Yard.

Firſt, a Pledget to be laid on the Wound when any Inciſion is made, as in the *Phymoſis*, *Paraphymoſis*, *&c.*

Secondly, an Emplaſter cut in the Form of a Croſs of *Maltha*, the Middle of which is to be laid on the End of the Yard, that ſo the Yard may be encompaſſed with its Four Tails.

Thirdly, a Compreſs of a fine and ſupple Rag, cut in the Form of a Croſs as before, to be laid over the Emplaſter.

Fourthly, a narrow Roller or Fillet of half an Ell long, and leſs than the Breadth of a Finger, with a Hole at one End, and cut lengthways at the other for the Breadth of Three Fingers. Put the Two Tails through the Hole at the oppoſite End of the Roller, and draw them to ſtreighten the End of the Yard.

Fifthly, a little Bag or Linen Caſe to keep the Yard in, with all its Dreſſings. It muſt be perforated at the End, to make Water through, without taking off the Dreſſings. A Girth muſt go round the Belly, to faſten the Tapes to which come from the Bag or Caſe.

The Dreſſing for a Fiſtula in Ano.

A *Fiſtula* in the *Anus* or Fundament is a callous or cavernous Ulcer, into which Inciſions are made to diſcharge the *Pus*.

Firſt, prepare Doſſils to dip in ſome Anodine Liquor or Unguent, to appeaſe the Pain in the Firſt Dreſſing; but after let them be dipp'd in ſome good Suppurative, and put as many of them as you can into the *Sinus*, to diſſolve the Calloſities.

Secondly, Pledgets to cover the Doſſils. For the Firſt Dreſſing, dip theſe in ſome Anodine Liniment, and after make Uſe of Digeſtives.

Thirdly, an Emplaſter of *Diapalma*, or ſome other as you judge convenient, for covering the Pledgits. This muſt be cut on one Side in Form of a Creſcent, that ſo it may fit the Side of the *Anus*.

Fourthly, the Compreſs made triangular, that it may be more handſomely applied, by putting the greateſt Side towards the Fundament.

The Dreſſings for all other Indiſpoſitions of the *Anus* are the ſame in the whole. The Additions and Diminutions cannot be provided for, but depend on the Surgeon's Judgment.

The Dreſſings for a perfect and imperfect Hernia, *or Rupture.*

A *Hernia*, or Rupture, is the Falling of the Guts or Caul, or ſome other of the Inteſtinal Parts, into the Groin or *Scrotum*. When theſe Parts fall into the *Scrotum* it is ſaid to be perfect.

To reduce theſe Parts into their natural Situation, make a large Inciſion on the Swelling, and then dreſs the Wound in the following Manner:

Firſt, a large capp'd Tent made of Linen Cloth, to be introduc'd into the Hole or Ring of the Muſcles after the Guts are reduced. This Tent muſt have a Head, and be tied at the upper End with a good Thread which may hang out of the Wound, to draw out at Pleaſure, and prevent it from ſlipping into the Belly. We have ſhewn the Manner of making this in the *Empyema*. Before you introduce this Tent into the Rings, arm it with a good Digeſtive. That uſed in the *Hotel Dieu* at *Paris* is made thus:

Take Oil of Roſes Three Ounces, Three Yolks of Eggs; beat theſe with a Stick in a Diſh, till the whole be well mix'd; and this is a very good Medicine againſt all Accidents. The Tent muſt be blunted at the End, for fear of hurting the Gut, and muſt be long enough to hinder the Guts from beating on the Rings, which would hinder the Coalition of the Wound.

The Second Application muſt be Doſſils made of Lint, and dipp'd in the above mentioned Medicine, to fill up the Wound.

Thirdly, Pledgets of Lint dipp'd in the ſame.

Fourthly, a large Emplaſter to cover the former Dreſſings.

Fifthly, a large triangular Compreſs, to be laid over the Emplaſter. This muſt be in ſeveral Doubles, and its largeſt Side laid towards the Groin.

Sixth

Sixthly, a great ſquare Compreſs in Four Leaves, which may cover the Dreſſings, and the whole Belly. This Compreſs is made Uſe of, becauſe before the Bandage is made, the Belly muſt be anointed with a ſtrengthening Liniment; and this keeps the Patient's Linen and Clothes from being fouled by the Medicine.

Seventhly, a Roller of an Inch and a half broad, and Three Ells long, roll'd up at one End only, for making the Bandage call'd the *Spica*. To make this, put the End of the Roller on the Hip oppoſite to the Side affected, and then bringing it over the Belly, and over the Wound, paſs under the Buttock; bring back the Roller over the Wound, and there make an X; turn under the Back, paſs over the Hip, over the Belly, and over the Wound, and there make an Edging; paſs over the Thigh, turn round and make a Second X; continue thus the Turns of your Roller, till the whole Dreſſing be cover'd, and end with ſeveral Rounds about the Body. This is the Bandage which is moſt commonly made for this Operation.

If the Rupture were perfect, and an Inciſion were made into the *Scrotum*, it ought to be fill'd with Pledgits dipp'd in the aforeſaid Liniment, and a Compreſs laid over all, and the *Scrotum* kept up in a Suſpenſary, or Bag-Truſs.

The Dreſſing for Caſtration.

Caſtration is an Amputation of the Teſticle when it is gangrened or mortified, or is ſo ſtreightly united to the Gut, that it cannot be ſeparated without taking off pretty much of its Subſtance; or when it is contuſed and bruiſed, and the Circulation is interrupted, or it is varicoſe. When the Operation is made, apply the Dreſſing thus:

Firſt, take a good Wax-Thread in Four Doubles, for tying the Veſſels as high as may be towards the Belly, before you take off the Teſticle; make a Turn as near the Ring as you can, and tie it; then make a Second Turn, and make Two Knots above. It is beſt to leave the Ends of the Threads without cutting them, and draw them a little to the Side of the Wound.

Secondly, ſeveral Doſſils of Lint, to be dipp'd in ſome good Digeſtive, to promote the Suppuration, and diſſolve the Carnoſities, which moſt commonly attend this Indiſpoſition.

Thirdly, large Pledgets of Lint for covering the Doſſils and Wound, being firſt dipp'd in ſome good Digeſtive.

Fourthly, a large *Diapalma* Emplaſter to cover the whole.

Fifthly, a Compreſs in Four Doubles to cover the Emplaſter.

Sixthly, a Bandage of the *Scrotum*, with Four Tails. Bring the Two upper round the Body, then croſs the lower one over another, ſo as to form a Sort of Pocket or Bag to put the Stones into, paſſing the Yard through a Hole made in the undivided Part; raiſe the Two Tails or lower Straps, and bring them on each Side over the Groin, to faſten them to the Girth that goes round the Body.

This Bandage is very convenient, and preferable to any other, becauſe it may be made as great or as ſmall as you pleaſe, by croſſing the Tails more or leſs over one another, and with Three or Four Cuts of the Siſſars it is done.

The Dreſſings for Cutting or Extracting the Stone *out of the* Bladder.

This Operation is an Inciſion into the *Perinæum*, to fetch the Stone out of the Bladder. After which the following Dreſſings are made:

Firſt, a large ſquare Compreſs in ſeveral Doubles, to be applied on the Wound made in the *Perinæum*, that ſo the Patient may be carried into his Bed as ſoon as he is cut, for fear leſt the Air ſhould hurt the Wound.

A robuſt Fellow muſt carry the Patient to bed in his Arms, and have one Hand on the Compreſs, to keep it on the Wound. When the Patient ſhall be laid in Bed on his Back, with his Knees raiſed, the Surgeon may take off the Compreſs, and apply the following Dreſſings:

Secondly, a Tent of Lint to be introduced into the Wound, when there is Ground to believe ſome Fragments of the Stone are in the Bladder, which is known by looking on

the

the Stone which is taken out; for if it appears to be broken, it may be imagined there remain ſome Parts in the Bladder. On the contrary, if it be ſmooth and poliſh'd, it may be judged to be entire. But inſtead of the Tent, I think it better to put a Silver Pipe into the Wound.

Thirdly, a Pledget of Lint as long as the Wound which it is laid over, being firſt covered with Bole to ſtop the Blood.

Fourthly, an Emplaſter to lay over the Pledgit. This muſt be ſhap'd like a Horſe-Shooe, and be covered with Bole. The broad Part is applied on the Wound, and the Two long Branches towards the Groins, between the Cods and the Thigh.

Fifthly, a large oblong Compreſs doubled, dipp'd in warm Oxycrate, which is applied over the Dreſſings, and with the other End the Cods are kept up, being firſt moiſten'd with Oil of Roſes to aſſwage the Pain.

Sixthly, the double T keeps up all the Dreſſings, imbrocating the Belly firſt with good Oil of Roſes, as well as all the contiguous Parts. In the *Hotel Dieu*, inſtead of the double T, they make Uſe of a large Sling with Four Tails. Apply the undivided Part on the Wound, and bring the Two Tails on each Side, and faſten them to the Scapulary; then do the ſame before as you did behind.

The Manner of making a Bed for a Woman who lies in.

It is beſt for a Woman to be delivered in her Bed, becauſe if this be done elſewhere, ſhe cannot without ſome Difficulty be carried to it, when ſhe is fatigued with her Labour.

Let her Bed be made with a Quilt only, without a Feather-Bed, for this is more convenient for her Delivery, and let ſeveral Clothes be laid over the Quilt, to receive the Waters, and hinder them from ſpoiling the Bedding, and incommoding the Woman. The Bed muſt be ſo made, that ſhe being laid on her Back, may ſit half erect. This Poſture is moſt convenient for Breathing; and ſhe will have more Strength to bear down and help her Throws. When ſhe is laid on her Back, with her Thighs ſpread, and her Knees raiſed, lay a Pillow under her Buttocks, that the Rump-Bone may more eaſily give Way; and let her have her Feet ſupported on ſomething that is ſteady, for her better bearing down her Throws. Obſerve, the Bed muſt be ſo made, that the Woman in Labour may have her Feet near the Feet of the Bed, ſo that the Midwife may aſſiſt her.

The Dreſſing uſed after Deliveries of Women.

Firſt, when the Birth is over, and the After-Birth come away, lay before the Womb a ſoft Linen Cloth, folded in Six Leaves, for fear leſt the cold Air enter whilſt you are preparing the reſt.

Secondly, after this lay a ſmall Pillow under each Ham, to ſupport them; and placing her half erect, let her put down her Thighs, and keep her Legs cloſe together; for ſuch a Situation is proper to help her Breathing, and give Way for her Cleanſing.

Thirdly, an Anodine Cataplaſm applied outwardly to the Entring of the Part, to appeaſe the Pain, and prevent Inflammation. Before this be applied, the Cloſure muſt be removed.

The Cataplaſm is thus made: Take Two Ounces of Oil of Sweet Almonds, and the Whites and Yolks of Two new-laid Eggs; put theſe into a little Skillet over warm Embers, till the Cataplaſm be of a good Conſiſtence; ſpread this on a Linen Cloth, and apply it warm on the Part. Renew this every Six Hours, if there be Occaſion; that is, if the Pains continue, and you apprehend an Inflammation.

Fourthly, a ſmall Plaiſter of *Galbanum*, on which ſome put a little Civet, to refreſh the Spirits, and comfort the Womb.

Fifthly, a Cloth folded obliquely in Four Leaves, to be applied on the Lower Belly, to compaſs it a little, for the Evacuation of Waters and Cleanſings.

Sixthly, a Swathe of a Quarter of an Ell in Breadth, to encompaſs the Belly, and keep the Compreſſes on. This is a large Napkin folded in Three Leaves. The Dreſſings are commonly uſed after the Operation only; yet it is neceſſary to put on ſome before the Woman's Delivery, becauſe afterwards being much tired, and very deſirous of

of Reſt, ſhe will not ſuffer them; and particularly the following, which is compoſed of a large Linen Cloth, which encompaſſes the whole Body. The upper Part of this is applied round the Breaſt, under the Arm-Pits, and the reſt falls down like a Smock. For the orderly applying this, roll it at both Ends; take one Roll in each Hand, and apply the Middle of the Cloth on the Patient's Back; then bring it forward, and croſs the Ends one over another. This is very uſeful, becauſe it is ſo eaſily removed after the Labour is over, only by drawing it off at the lower End.

Of Irregular Dreſſings.

The Irregular Dreſſings are ſo numerous, that they deſerve a particular and ſeparate Treatiſe to deſcribe them; nevertheleſs, we ſhall reduce them all to Two general Rules, that is, to refer them as much as may be to the regular Dreſſings before deſcribed, and to accommodate them to the Figure of the Part; and this requires Addreſs and Senſe in the Surgeon.

A Dreſſing for an Ulcer behind the Ear.

Lay a ſmall Pledget on the Ulcer, and let this be arm'd with a Digeſtive, if you would ſuppurate, or a Deſiccative, if you would dry it. Lay the Emplaſter in the Form of a Half-Moon over the Pledget. You'll find it muſt have this Shape, to accommodate it ſelf to the Part; for not only the Dreſſing is more neat, but it covers the Pledgit better. It would be very inconvenient to keep this ſmall Dreſſing on with a Bandage, therefore lay a ſticking Plaiſter on it, which will ſave of it ſelf. You muſt never multiply the Pieces of your Dreſſings without Cauſe, for they are troubleſome enough of themſelves.

A Dreſſing for the Stump of a Finger which is taken off.

Lay a Pledget on the Wound, and arm it with ſuch a Liniment as you ſhall think fit. Lay on this a long Plaiſter; apply the Middle of it on the Wound, and let one End fall on the Outſide, and the other on the Inſide of the Hand. You may perceive this Part will require more Application than ordinary, becauſe the Hand is always in Motion: Therefore you muſt lay on a Compreſs as broad as the Space between the Fingers, and long enough to cover the Emplaſter, which falls over and within the Hand. You muſt keep this Compreſs ſteady with another, which is Two Inches broad, and long enough to go round the Hand, bringing it between the Thumb and Fore-Finger, and cover the Firſt Compreſs; then pin one End on the other, which not being ſufficient to keep on the Dreſſings, you muſt make Uſe of a Fillet as broad as the Points of Two Fingers, and about an Ell long, roll'd up at one End; make Two Rounds about the Wriſt, bring down the Roller on the Back of the Hand, paſs it over the Wound, and then within the Hand, and after round the Wriſt; continue till the Fillet is ſpent, and then faſten it round the Wriſt, and ſo you will have a ſmall and pretty neat Bandage, which will hold very well, and keep the Medicines on the Part. Here you ſee an Occaſion for good Senſe to direct you. The Emplaſter is made broader where it is to go on the Outſide and the Inſide of the Hand, than where it covers the Wound, becauſe ſuch a Shape helps to keep it on the Part. The Compreſs is contriv'd to keep the Emplaſter on, and the Fillet is uſed, becauſe without ſuch a Bandage, it would be difficult to retain the former between the Fingers.

The Dreſſing for a Wound or Ulcer on the Buttocks.

Lay your Pledgets on the Wound, and your Emplaſter over, and then a Compreſs. You ſee theſe Applications cannot be kept on by rolling the Part; therefore make Uſe of a large ſquare Piece of Linen Cloth, with a Strap faſten'd to each Corner. This is call'd the Buttock Piece. Bring the Two Straps round the Hips, and apply the Middle of the Cloth on the ſuffering Part, and then bring the Two other Straps round the Thigh. This Bandage is very convenient.

The

The Dreſſing for an Extraction of the Stone.

This Operation conſiſts in making an Inciſion into the Yard, to bring the Stone out of the *Urethra*. You know the Cicatrizing does ſtreighten the Part, and therefore it may be feared that the *Urethra* may be ſo cloſed, that the Urine could not come away, and therefore you may paſs into the Duct a ſmall Leaden Pipe, to keep it open whilſt the *Cicatrice* is forming. You muſt lay on the Wound a little longiſh Pledgit, armed with ſome Balſam, and over it a ſmall Emplaſter. Keep all on with a little Fillet of One Finger's Breadth, with a Hole at one End, and ſlit lengthways for Two Inches at the other. Paſs the Two Tails through the Hole at the oppoſite End of the Fillet. Put the Yard into this Fillet; then riſe and deſcend with ſmall Edgings; and when the Fillet is ſpent, faſten it at the End. If this be not ſufficient, put the Yard into a Bag or Caſe. This Bag muſt have a Hole at the End, for the Urine to paſs through without taking it off, and muſt have Two Tapes or ſmall Straps, to faſten it to the Girth which goes round the Waſt, for the keeping it up.

A Dreſſing for a Wound in the Head, where the Bone is bare, the Tegu-ments ſeparated from it, and there is a great Putrefaction.

Since there is Putrefaction, and a large Suppuration, and the Bone is bare, you may perceive it is carious, and there is no Room to hope that the Skin ſhould grow to it. Lay then your Pledgits between the Bone and the Skin, having firſt dipp'd them in ſome ſpirituous Liquor, to receive the natural Heat of the Part. Let theſe be made large enough to cover the Lips of the Wound. There can be no Suppuration here, but that the *Pus* muſt neceſſarily corrupt the Bone; and therefore it is not to be hoped, that ſuch a Wound can be cured without Exfoliation, wherefore you muſt lay on the Bone a Pledgit dipp'd in ſome ſpirituous Liquor to advance it: But if you hope to avoid this, then uſe only a dry Pledgit. After this, lay a large Emplaſter over the whole Wound, which you muſt ſnip with the Siſſars round, that it may accommodate it ſelf to the Figure of the Head; for it is a general Rule for all Emplaſters, that you muſt give them ſeveral Snips with the Siſſars on their Edges, for the better adjuſting them to the Part when it is round, as the Knee, Shoulder, *&c.* In the laſt Place, lay a Compreſs of Rags doubled over all, and keep the Dreſſings on with a folded Handkerchief.

A Dreſſing for a large Ulcer, where-ever it be, as on the Thigh, one Part of which is red, the other fungous, and over-run with ſuperfluous Fleſh, another cavernous, another ſanious, another Part callous, which accidentally often happen to the ſame Wound.

Since there is one Part red, there is a Diſpoſition to cicatrize, and therefore you muſt lay on it a Pledgit of dry Lint; ſince another Part of the Ulcer is fungous, you muſt touch it with a Cauſtick, and then lay a dry Pledget on the Place; and at the next Dreſſing look on it, to ſee if the Fungoſities are gone, and then put a Pledgit armed with deterging Medicines on it. If there be another Part cavernous, by the Help of a Probe, you muſt thruſt a Pledgit dipp'd in ſome Digeſtive into the Wound, if there be Need of procuring Suppuration; or a Detergent, if the Suppuration be good, and the Matter not ſtinking or virulent. In the Place where the Wound yields a *Sanies*, lay on it a Pledgit armed with a Digeſtive, and remove the Calloſities by a Cauſtick: Over all lay a large Emplaſter, a Compreſs, and apply a convenient Bandage. You may ſee by this ſmall *Specimen*, that the irregular Dreſſings are infinite, ſince they differ according to the Circumſtance of the Diſeaſe and the Part affected.

The Dreſſing for Bleeding in the Fo

This Dreſſing muſt not be forgot, and is made after a Manner not much differing from that of the Arm. Let your Compreſs be ſomething thicker. The Bandage is made with a Roller Two Ells long. Put one

of the Roller on the Knee, and lay the Patient's Heel on it; bring the Roller ſeveral Times over the Compreſs, as is done on the Arm, and after paſs under the Foot. The End of the Roller which is laid under the Heel is to make a Stirrop, that ſo the Roller may not fall to the Ground. Tie the Two Ends, and make a Bow on the Knot, as in Bleeding in the Arm.

The Dreſſing for a Diſlocation of the Knee, not reckon'd among the irregular Dreſſings.

Take a Compreſs about an Inch thick, to lay under the Ham, to hinder the Bandage from preſſing on the Blood-Veſſels and Tendons. One End of this Compreſs muſt advance under the Thigh, and the other under the Leg, and be large enough to embrace the Ham. Let a Servant keep this Compreſs on, and apply over it the following Bandage:

Take a Roller with Two Heads, Three Ells in Length, and an Inch and half broad; apply the Middle of your Roller immediately above the Knee; bring down the Two Heads under the Ham, and there croſs them; turn round the Ham immediately, and *Rotula*, and make an X on the Leg; reaſcend by the Ham, and there croſs; make an X above the Knee, approaching a little to it, ſo as to cover it by Degrees; deſcend under the Ham, and make an X on the Leg, approaching thus gradually with X's over the Knee till it be covered, then faſten your Roller with ſeveral Rounds above the Knee.

The Dreſſing for a Diſlocation of the *Rotula* is the ſame with that for the Knee in every Reſpect and Circumſtance.

An Abſtract of certain Directions given by Monſieur Le Clerc, *Phyſician in Ordinary to the preſent* French *King, for the Dreſſings and Bandages after* Trepanning. *From the* French *Original.*

THE Firſt Thing he recommends in this Caſe is a falſe Tent made of Lint, in which is to be concealed a Lancet for the piercing of the *Dura Mater*, in caſe there be a Suſpicion of any purulent Matter being beneath it.

The Second is a *Syndon* of Lint, a little larger than the Hole made in the Skull by Perforation, ſteep'd in a Mixture of Spirit of Wine and Honey of Roſes. It muſt be even and flat, that it may be put cloſe through the Hole upon the *Dura Mater*, without preſſing upon it. The *Syndon* ought to be tied with a Thread, that hangs out over the Skull, that in caſe it ſhould ſlip under the Bones, it may be drawn out by the Thread.

To make this *Syndon* of Lint, he ſays, you muſt draw out of ſome ſoft Lint as much as may be about the Thickneſs of a Gooſe Quill, then tie this ſmall Packet of Lint in the Middle with a Thread, then ſpread it round like ſo many Rays, and cut it exactly circular.

Some rather chooſe a *Syndon* made of a ſmall Piece of a ſoft Rag, for fear ſome of the Threads of that of Lint ſhould ſtick betwixt the Skull and the *Dura Mater*.

In caſe any fungous Excreſcencies ariſe, Deſiccatives muſt be applied, ſuch as Spirit of Wine, and Tincture of Aloes; and if theſe prove too weak, the Powder of Turpentine, the *Iris Floret*, and *Alum:* After the Uſe of which Remedies, the aforeſaid *Syndon* muſt be ſteep'd in White Wine, wherein the vulnerary Plants have been boil'd, mix'd with a little Honey of Roſes.

The Third is, to lay ſmall Pledgits made of Lint, of the Bigneſs of the Hole made by the Trepan, one upon another over the *Syndon*, ſo as to fill up the whole Aperture in the Bone. They muſt be gently preſs'd in with the Lenticular Inſtrument, and wetted beforehand with ſome ſpirituous Liquid.

The Fourth is, to apply a dry Pledgit immediately over the Aperture on the Bone: For, adds he, Medicines are never to be applied to the Bones, unleſs you intend to procure an Exfoliation, in order to have the Aperture of the Skull covered with Fleſh.

The Oil of *Guajacum*, and Tincture of *Euphorbium*, are excellent to anſwer this End.

The Fifth is, to put within the Lips of the Wounds ſmall Doſſils of Lint, dipp'd in a Mixture of Yolks of Eggs, Turpentine, and Oil of Roſes, to further Suppuration, and hinder the too quick Growth of the Fleſh, *viz.* before the Generation of the *Callus*, which he ſays will not be till Forty or Fifty Days after the Trepanation.

The Sixth is, to apply a large Pledgit over the whole Wound, and this Pledgit is to be charged with the ſame Digeſtive of Yolks of Eggs, *&c.* as the Doſſils.

The Seventh, to apply an Emplaſter over all the aforeſaid Dreſſings.

He adviſes alſo to have the whole Head ſhaved, and to embrocate it with Oil of Roſes, and Spirit of Wine.

The Eighth is a Compreſs of Linen Rags, laid in Four Doubles, to be laid over the whole Part.

The Ninth and laſt is the Bandage, which muſt be either the folded Handkerchief, or, if you diſlike that, a large Napkin, ſomething longer than broad, to be doubled lengthways in its Middle, but ſo, as to leave one of its Ends Four or Five Inches longer than the other. The middle Part of this Napkin is to be applied to the Patient's Head, ſo that the longeſt Side may immediately touch it, whilſt a Servant is holding his Hand very gently on the Dreſſing. Let the upper Ends of the Napkin be held under the Chin of the Patient, whilſt the Chirurgeon himſelf draws the Two lower Ends, one with each Hand, horizontally on each Side, ſo as to raiſe the depending Part of the Napkin over the Forehead, and then croſs the Two Ends behind the Head, without making any Wrinkles; then let them be brought forward again, and pinn'd at their Extremities. The Two Ends of the Napkin, one of which hangs over each Shoulder, ſhall be raiſed over the Head, without any Pleats or Inequalities, and brought to the Eyes. The Two Ends which were held under the Chin, muſt be then faſten'd in a Knot, or pinn'd together. This is call'd the *Great Cap*.

He tells us of another Bandage, made alſo of a fine Napkin, laid together Diagenal-wiſe, or in a Triangular Form. The Middle of it is to be taken in both your Hands, ſo that the Two Thumbs be on the Fold one over-againſt the other. The Middle of this Napkin being applied to the Patient's Forehead, the Two Ends are brought behind the Head, by ſliding the Hand all along the Napkin. The Two Ends being brought back over the Forehead, are there pinn'd together at their Extremities, and the other Two Ends faſten'd behind the Head. This Bandage is eaſier made than the former.

The Tenth is to put a woollen Cap, made of Four Pieces, cut in a triangular Form, and ſtitch'd together over all the Dreſſing.

He adds this further Obſervation, That moiſt Places are excellent for the Diſeaſes of the Head, but noxious for the Diſtempers of the Legs.

Directions given by Monſieur Le Clerk, *for the Cure of a complicate Fracture of the Noſe.*

A Fracture on the Noſe, with a Wound in the Fleſh, is call'd a Complicate Fracture. The Bones being reduced, you muſt take the following Directions in the Dreſſing.

Firſt, a ſmall *Cannula* or Pipe of Lead, flat at the End, to be put up the Noſe, to ſupport the reduced Bones, with a ſmall Ring at the Bottom, into which a Ribbon is to be put, the End of which is to be faſten'd to the Cap, to keep the hollow Pipe within the Noſe, which, before it is put in, is to be dipp'd into Oil of Turpentine, be up with Spirit of Wine.

This Pipe alone is ſufficient, if there no Wound; but if there be, take theſe fu ther Directions:

Secondly, a ſmall oblong Pledgit, charg with a proper Unguent.

Thirdly, a ſmall Triangular Compreſs, be applied to both Sides of the Noſe.

Fourth

Fourthly, a ſmall Paſtboard of the ſame Figure of the Compreſs, and to be applied over it on both Sides of the Noſe.

Fifthly, a ſmall *Sling* with Four Tails, being nothing elſe but a Piece of Linen Cloth, of the Breadth of about an Inch and a half, and half an Ell long, folded in half, and ſlit all along lengthways through the Middle, but ſo as to leave about Two Inches uncut in the Midſt. The uncut Part of this Sling being applied to the Noſe, the Two upper Tails muſt be brought behind the Head, where croſſing each other, they are brought back again before, and and pinn'd together at their Ends. The Two lower Ends being brought alſo behind the Head, ſo as to croſs over the upper, they are croſs'd behind, and brought back before, where they are pinn'd to the Patient's Cap, at their Extremities one over another.

The Author makes this general Obſervation concerning the Application of this Bandage call'd the *Sling*, always to begin with the upper Ends, and to make the lower Tails croſs over the upper Tails.

Directions given by Monſieur Le Clerc, *&c. concerning the Dreſſing of Hair-Lips, after the Suture of the Cleft-Lip.*

Firſt, if you will turn the Thread right, you muſt firſt turn it Three or Four Times round beneath the Needle, then croſs the Thread over the Needle, then paſs under it, then over it, and then under again, till the Lip be covered. If the Cleft be very long, you muſt convey Two or Three Needles into the Lip, and wind the Threads round each of them as before. The Needles muſt alſo be cut at the Ends.

Secondly, ſmall Compreſſes to be placed under the Needles.

Thirdly, an oblong Pledgit of Lint, charged with ſome balſamick or reſtringent Liquid, to be applied to the Wound.

Fourthly, an Emplaſter to be laid over the Pledgit, with Three Branches, Two of which aſcend up the Noſtrils, and the lower Part to the Wound over the Pledgit.

Fifthly, an oblong Compreſs of Linen, to be put between the Upper-Teeth and the Lip, to keep them aſunder.

Sixthly, an uniting Roller or Fillet, made with a Piece of Linen Cloth, of an Inch Breadth, and near an Ell in Length, with a Slit in the Middle, of an Inch and a half, wide lengthways.

Apply this Band with both the Hands on the hind Part of the Head, and bring the Ends forwards, ſo as that one of the Ends come through the Slit, which muſt be exactly upon the Lip; bring back the Two Ends behind the Head, over the ſame Turns of the Roller; bring them again forward over the Lip, and then once more bring them back over the ſame Turns, and pin the Ends together. Inſtead of this, the Sling with Four Tails (deſcribed in the Fracture of the Noſe) may be made Uſe of, *viz.* by applying the middle and uncut Part to the Wound in the Lip; bringing the upper Tails behind, and croſſing them there; bringing them again forwards, and there to pin the Ends to the Patient's Cap. Then the Two lower Tails muſt be brought to the hind Part of the Head, ſo as to croſs and bring them over the upper Ends or Tails, and then to bring them forward, and pin together at their Extremities.

The Firſt Dreſſing muſt be kept on for ſeveral Days, and the Needles not be drawn out till there be a compleat Reunion of the Wound.

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ort Directions for the Dreſſing of a Fracture of a Jaw on one Side. By Monſieur Le Clerc, *&c.*

Firſt, a Compreſs doubled together ſeveral Times, ſhaped almoſt like the Under-Jaw, dipp'd in Oxycrate or warm Wine, and then to be applied to the Flat of the Jaw, with the pointed End on the Side of the Chin, and the broad End on the

oppoſite Side, on the *Apophyſes*, it being as big as the Jaw it ſelf.

Secondly, a Paſtboard of the ſame Shape and Size as the Jaw, to be put over the Compreſs.

Thirdly, a Bandage call'd the Sling with Four Tails, having a great long Slit in its Middle, to put the Chin in; which done, the upper Tails muſt be brought a little backwards over the upper Part of the Head, and being croſs'd there, to be brought back again over the Temples, or on each Side, and to be pinn'd at their Ends. Then the Two lower Ends or Tails are to be croſs'd, ſo as to aſcend over the upper Tails, and over the Top of the Head: Being croſs'd here, they are brought back to the Temples, and there pinn'd to the Patient's Cap.

This *Sling* muſt be broad enough to cover the Chin and the whole Jaw, and of about an Ell in Length, and is much more commodious than the Bandage call'd the *Capiſtrum* by the Ancients.

Directions for Dreſſing a Fracture of the Jaw on both Sides. By Monſieur Le Clerc, *&c.*

Firſt, a Compreſs of Linen Cloth doubled ſeveral Times together, of the ſame Figure with the Lower-Jaw, with a Hole in the Middle to put the Chin in. After it is well dipp'd in Oxycrate, or warm Red Wine, it muſt be adjuſted to the flat of the Jaw on both Sides.

Secondly, a Paſtboard of the ſame Shape with the Compreſs, with a Hole in the Middle alſo. Dip it in Oxycrate, or hot Red Wine, and apply it over the Compreſs

Thirdly, a Sling with Four Tails, about Three Inches broad, and an Ell long at leaſt, with a Slit alſo in the Middle, to put the Chin into; which done, the Two upper Tails muſt be brought over the Top of the Head; and being croſs'd there, be brought down again on each Side, and pinn'd to the Patient's Cap there. This Bandage muſt be made pretty ſtreight, and is much more convenient than the Bandage call'd the *Capiſtrum*, uſed by the Ancients.

As for the Dreſſings of a Luxation of the Jaw, they are the ſame as for a Fracture of the ſaid Part, *viz.* if the Diſlocation be on one Side only, the Dreſſings of the Fracture on one Side takes Place; and if it be on both Sides, the Dreſſings and Bandages uſed in the Fractures of the Jaw on both Sides, muſt be made Uſe of here alſo.

Directions for the Dreſſings for the Fracture of the Clavicle. By Monſieur Le Clerc.

Firſt, Two longitudinal Compreſſes, to be applied over and under the *Clavicula* lengthways, to fill up the Hollowneſs. Theſe Compreſſes muſt be folded back at the End in divers Doubles, the better to fill up the Cavities over and under the *Scapula*, they being deeper towards the *Humerus* than towards the Breaſt.

Theſe Compreſſes are to riſe higher than the *Clavicula*, ſo that ſeveral may be laid one over the other, becauſe no Compreſs or Paſtboard muſt be laid lengthways over the *Clavicula*.

Secondly, Two oblong Compreſſes, to be laid over the former, in the Shape of a St. *Andrew*'s Croſs.

Thirdly, a broad longiſh Paſtboard, made waved at both Ends, for the receiving of the Neck and Head of the *Humerus*. After it has been dipp'd in Oxycrate or warm Wine, it is to be laid over the Clavicle.

Fourthly, a Bandage call'd the *Spica*, when the Fracture is near the Shoulder-Bone, being made of a Band of Five Ells long, and an Inch and a half broad. When you are to apply it, you muſt bring it behind the End of the Band, under the Armpit, oppoſite to that where the Fracture is, which whilſt it is held there by a Servant, let the Chirurgeon paſs with the other End over the Shoulder that is affected. Let him paſs under the Armpit, repaſs over the Shoul-

der

der, and there make an X: Then let him bring the Band over the Breaſt, repaſs under the Shoulder, and there engage the End of the Band: Let him return behind, and paſs over the Shoulder, under the Armpit, and then return above, ſo as to make an X nearer to the Neck than the former: Let him thus go on to make divers X's on the broken Clavicle, and with the Remainder of the Band make Two Turns round the upper Part of the Arm, and there faſten the Band. 'Tis further to be obſerved, that to keep down every X that is made to cover the Length of the *Clavicle*, it muſt be pinn'd in the Place where it croſſes.

In caſe the Fracture be nearer to the Breaſt-Bone than to the Shoulder-Bone, a Bandage call'd the *Capeline*, conſiſting of a Band of Six Ells long, and an Inch and a half broad, roll'd up at both Ends, is moſt commonly made Uſe of, though it be leſs commodious and more troubleſom than the afore-mentioned *Spica*.

When you are to apply this, you muſt apply the Middle of it to the fractured Part, and then bring one of the Heads ſtreight over the Breaſt, ſo as to make a right Angle with the *Clavicula*: Here it muſt be held by ſome Servant, whilſt you with the other End deſcend obliquely over the Back, and and ſo under the Armpit oppoſite to that Side where the Fracture is: But take Care firſt to put a good Linen Compreſs under the Armpit; then paſs the Band over the Breaſt, and over that End of it that is held all this while by the Servant, ſo as to engage it under it: Then let him raiſe the End he holds in his Hand, and bring it over the fractured Part, ſo as to make an Edging on that you bring over the Shoulder; next let him go down the Patient's Back: Then bring the End which you hold in your Hand over that which the Servant holds on the Patient's back, ſo as to engage his under yours: Let him raiſe his End of the Band over the Fracture, and make an Edging over the Firſt Turns of the Band, whilſt you are bringing yours under the ſound Arm, and ſo repaſs over the Breaſt, ſo as to engage that which he holds. Theſe Edgings muſt be thus continued over the *Clavicula*, until it be wholly covered; and then the Band may be faſten'd with ſeveral Rounds about the Body of the Patient.

Fifthly, an Iron Croſs like that uſed for round-ſhoulder'd or crooked Children, to be applied to the Patient's Back to thruſt the Shoulders forward, and prevent the *Clavicles* from falling inward. The Croſs-Bar of this Croſs, which is to be Two Inches broad, muſt be covered with ſome Dimety, or ſome other Woollen Stuff, and muſt be of ſuch a Length, as to reach from one Shoulder to the other, and the perpendicular Bar or Stem from the upper End to the lowermoſt Part of the Spine, where it muſt have a Hole, to paſs Two Strings, *viz.* one on each Side through it, wherewith to tie it cloſe to the Back, by bringing the Strings round the Body.

If notwithſtanding this the Croſs does not thruſt the Shoulders ſufficiently forward, a thick Compreſs muſt be applied under the perpendicular Bars of the Croſs, but ſo, as not to go quite down to the Bottom of it. At each End of the Croſs-Bar are Two Iron Rings, through which the Patient is to put his Arms; and theſe Rings may be taken off and put on again at Pleaſure.

Directions for the Dreſſings for a Diſlocation of the Humerus. *By Monſieur* Le Clerc, *&c.*

Firſt, a ſmall Bolſter of Linen, to be placed under the Armpit, to keep the Head of the Bone after its Reduction in its natural Poſition.

Secondly, the Bandage call'd the *Sling*, with Four Tails, the middle and uncut Part to be applied to the Pollet under the Armpit, and the Four Ends to be brought over the Shoulder, there to be croſs'd and pinn'd.

Thirdly, a Linen Compreſs doubled ſeveral Times together, to be put under the ſound Armpit, to keep it from being gall'd by the Roller.

Fourthly, the Bandage call'd the *Spica*, conſiſting of a Band or Roller of Five Ells long,

long, and Three Inches broad, being applied for the reſt as before, in the Fracture of the *Clavicle*. Obſerve, that before this Dreſſing is applied, the affected Part is to be embrocated with warm Oil of Roſes, and the Band to be dipp'd in Oxycrate or warm Red Wine.

Directions for Dreſſings for a Fracture of the Humerus. *By the ſame Monſieur* Le Clerc.

Firſt, a large Piece of Linen Cloth, cut at each End lengthways like the Sling, to be dipp'd in Oxycrate or warm Wine, or ſpread with *Ceratum Refrigerans*, to be applied round the Arm over the Fracture.

Secondly, a Band of Two Inches in Breadth, and an Ell and a half in Length, roll'd only at one End, to be applied immediately over the aforeſaid Piece of Cloth. With this you make firſt Three Turns round the Fracture pretty ſtreight; then aſcend to the upper Part of the Arm, ſo as to make ſeveral ſmall Edgings, and there terminating with ſome Rounds, pin the Extremity of the Roller.

Thirdly, another Band or Roller with one Head, Two Inches in Breadth, and an Ell and a half long. This is to be applied over the former, ſo as to make firſt Two Turns or Rounds about the Arm over the Fracture; and then deſcending with ſmall Edgings, it is to be brought over the Elbow without covering it, and terminate with divers Circumvolutions about the Cubit near the Elbow.

Fourthly, Four Linen Compreſſes, doubled ſeveral Times together, Six Inches long, and Two broad, to be dipp'd in Oxycrate and warm Red Wine, and then to be applied lengthways round the Arm upon the Fracture.

Fifthly, Four ſmall Splinters of light Wood, of the ſame Length and Breadth as the aformentioned Compreſſes; each of theſe being to be applied lengthways to one of the Compreſſes. They muſt be rounded at their Extremities.

Sixthly, a Band of Two Ells in Length, and about Two Inches broad, with one Head, wherewith to make Two Turnings immediately about the Splints over the Fracture: After which you muſt aſcend with Edging, and then deſcend below the Elbow, and there faſten it.

Seventhly, Two large Paſtboards, rounded at the Ends, and to be applied lengthways round and the whole Length of the Arm, ſo as to embrace the Dreſſing without touching each other; after having been firſt dipp'd in warm Oxycrate, which will make them ſtick the cloſer when they are dried again.

Eighthly, Three or Four Ribbons, of an Inch and a half broad, to be tied round the Paſtboard; but you muſt begin in the Middle of it firſt, elſe it would ſtart up at One End.

Ninthly, a large Napkin, to make a Kind of a Scarf of, for the Support of the fractured Arm. The richer Sort wear the Arm in Scarfs of Silk.

Directions for the Dreſſings for the Fracture of the Shoulder-Blade. By Monſieur Le Clerk, *&c.*

Firſt, a Piece of Linen Cloth, dipp'd in warm Oxycrate or Red Wine, or ſpread with *Unguent. alb. refrigerans*, to be applied to the fractured Shoulder-Blade, after it has been embrocated with Oil of Roſes to allay the Pain.

Secondly, a large Compreſs doubled ſeveral Times together, ſhaped moſt commonly like the *Scapula*; but a Four-ſquare one, ſo as to cover the whole Shoulder, anſwers the ſame End.

Thirdly, a large Paſtboard, to be put over the aforeſaid Compreſs, and conſequently is to be of the ſame Figure, and to be dipp'd in the ſame Liquor before it is applied.

Fourthly,

Fourthly, the Bandage call'd the *Star*, to be made of a Band with one Head, being Two Inches broad, and Four Ells long. When it is to be applied, the Band muſt be put behind, and the End of it under the ſound Armpit, where it is to be held by a Servant; the Head, that is in the Chirurgeon's Hand, muſt be brought under the other Armpit, and then over the Shoulder, ſo as to make an X on the Middle of the Back, by croſſing over the firſt Caſt: Thence paſs under the ſound Armpit, and ſo over the Shoulder down over the Back, to make an X on the Middle of the Back, ſo as to make an Edging with the Firſt Caſts: Continue thoſe Turns with the Band in the ſame Manner as you began, by making Croſſes of X's with Edgings on the Back, till both the Shoulder-Blades be covered with the Bandage, which does not come over the Breaſt, but only over the Back and Shoulder.

Directions for the Dreſſings for a Diſlocation of the Elbow. By the ſame Monſieur Le Clerc.

Firſt, a Compreſs made of a Piece of ſingle Linen Cloth, Three Inches in Breadth, and of ſuch a Length as to go conveniently round the Arm, cut at its Two Ends in the Manner of a *Sling*: This being ſteep'd in warm Oxycrate or Wine, muſt be applied in its Middle on the Bending of the Elbow, and the Four Tails round the Arm.

Secondly, a Band with one Head, of Five Ells in Length, and an Inch and a half in Breadth. With the End of this you muſt make a Turn about the lower Part of the *Humerus*, and then deſcend obliquely on the bending of the Arm, as in Phlebotomy, and make another Turn alſo below the Elbow on the ſuperior Part of the Fore-Arm; reaſcend along the Bending of the Arm, to make an X on the Firſt Caſt of the Band, and ſo go on to make X's with Edgings on the Elbow, till it be quite covered; after which, aſcend with Edgings quite to the ſuperior Part of the Arm, and there, after you have made ſeveral Rounds, pin it. It muſt be ſteep'd in warm Wine before it is applied to the Part.

Thirdly, a fine Linen Cloth, or a Piece of Silk, to make a Scarf to ſupport the Arm.

Directions for the Dreſſings for a Fracture of the Fore-Arm, whether one or both the Bones be fractured. By Monſieur Le Clerc, *&c.*

Firſt, a Sort of a Compreſs, or pretty large Piece of ſingle Linen Cloth, with a Slit at each End, to be dipp'd in warm Wine or Oxycrate, and then to be applied on the fractured Part of the Fore-Arm.

Secondly, Two pretty large Compreſſes, of the ſame Length with the Fore-Arm, and ſuch a Breadth as to exceed the Depth of it. One of theſe is to be applied lengthways on the flat Side of the Arm, and the other on the Outſide after the ſame Manner. Theſe Compreſſes muſt be deeper than the Arm, that the Band may not bear on and thruſt both the Bones into the Interſtice that is betwixt them.

Thirdly, Paſtboard, or elſe Splinters of Wood, of the ſame Shape of the Compreſſes, becauſe they are to be laid over them the whole Length.

Fourthly, a Band with one Head, of an Ell and a half in Length, and Two Inches in Breadth. With this you muſt make Two Turns immediately over the Splints, exactly upon the Fracture, with the End of the Band pretty cloſe; then aſcend with Edgings till you bring it above the Elbow, where, after you have made ſeveral Rounds, pin it.

Fifthly, another Band with One Head, of the ſame Length and Breadth as the next preceding. With this you make in like Manner Two or Three Rounds upon the Fracture, and thence deſcending by ſmall Edgings all along the Fore-Arm to the Hand; paſs it betwixt the Thumb and Fore-Finger, make

make ſome Turns about the Wriſt, and there faſten it with a Pin.

Sixthly, Two large Paſtboards of the ſame Length as the Fore-Arm it ſelf, and large enough to encompaſs it without touching it. Being rounded at the End, and dip'd in *Oxycrate*, apply them ſmoothly, the one within, and the other on the outſide of the Fore-Arm.

Seventhly, a Third Band with one Head, two Ells in Length, and as many Inches in Breadth. To apply this, you muſt begin with ſeveral Rounds about the Middle of the Paſtboards, then aſcend, and after that deſcend again, by divers Edgings, and pin the Band where it terminates.

You may tie theſe Paſtboards, inſtead of this Roller, with three or four Ribbons, beginning in the Middle, and to tie the Bow behind the Arm.

Eighthly, a large Napkin, or Piece of Linen Cloth, or of Silk, to make a Scarf for the Support of the Arm.

Directions for the Firſt Dreſſings for the Amputation of an Arm or Fore-Arm. By Mouſieur Le Clerc, &c.

Firſt, waxed Thread of about a Foot long, and double, for the making of a Ligature upon an Artery. They are to be apply'd thus: Take a *Forceps* that ſhuts with a ſmall Ring, which being brought down to the lower End of the Branches, it does hold any Thing it is put to very cloſe. With this you muſt take hold of the Extremity of the Artery, whilſt another with a crooked Needle, threaded with a wax'd Thread, paſſes into the Fleſh at the Root of the Artery, to the Middle, and after that pricks it again on the other Side of the Veſſel, as before; and laſtly, ties the Two Ends of the Thread cloſe about the Artery.

Secondly, a Stick of Wood wherewith the Ligature is ſtraightened, to ſtop the Blood.

Thirdly, a Ligature of ſome Woollen Stuff or Cloth of an Ell in length, and an Inch and a half in Breadth. This muſt be wound twice round the Arm, and the *Turniket* to be put over it.

Fourthly, a Paſtboard to be put under the Ligature, to prevent the pinching of the Skin by the Turniket.

Fifthly, another Ligature of woollen Cloth of an Ell long, and an Inch and a half in breadth, wherewith to make two Turns about the Arm, near the Place where the Amputation is to be made.

Sixthly, Balls of Tow about the Bigneſs of the End of a Man's Thumb, fill'd with Vitriol groſly powdered. Theſe are to be apply'd one to each Aperture of the Artery, when you do not make uſe of the Turniket.

Seventhly, a ſmall Compreſs of Linen, doubled together ſeveral Times, to keep on the Balls of Vitriol.

Eighthly, a large Pledgit of Tow, charged with adſtringent Powders. This muſt be applied to the Bottom of the Stump where the Amputation has been made; but ſo as to riſe above the Edges: It muſt be kept on with the Hand, till you can apply over it.

Ninthly, a dried Hog's Bladder, cut like a Croſs of *Maltha*, the four Ends to be raiſed on the Arm ſo as to encompaſs it. Within the Bladder muſt be put ſome Stiptick Powders.

Tenthly, a large Emplaſter of *Minium*, cut in the ſame Shape with the Bladder, and to be applied over it after the ſame Manner.

Eleventhly, a large Compreſs of Cloth doubled, cut likewiſe in the Figure of a *Malteſe* Croſs, to be applied all over the Emplaſter.

Twelfthly, Three Compreſſes doubled four Times together, of about a Foot in Length and an Inch and a half in Breadth. Two of theſe muſt croſs each other in the Middle of the Stump; ſo that the Ends are raiſed about the Arm; and the Third circularly about the Arm and the Ends of the two former Compreſſes, ſo that its two Extremities may croſs each other.

Thirteenthly, a Band of four Ells in Length and two Inches in Breadth, to make the Bandage called the *Capeline*. With this you muſt firſt of all make Three Turns about the Edges of the Stump, after which you bring

up the Band with Edgings above the Elbow, and make ſeveral Turns about the Arm; bring it down all along the Arm, to paſs over the middle of the Part where the Amputation is made, then aſcend the whole Length, and paſs quite over the Elbow, and there make a Turn about the Arm, to keep the two Caſts of the Band which you have carried down and up. After this, bring down the Band again, ſo as to paſs over the Wound; then go up again above the Elbow, and make a Round, and ſo paſs over the Stump till it be quite covered. Carry up the Band with ſmall Edgings, to keep on all the former Rounds about the Arm, and faſten all with Turns about the Elbow; then let the Arm reſt in a Pillow. The Dreſſing muſt be taken off gently; and after Suppuration, the Compreſſes muſt be kept cloſe to the Stump, to prevent the growing of fungous Fleſh.

As for the Dreſſings for the Amputation of an Arm, it is the ſame with that of the Fore-Arm, with this Difference only, That whereas in the former the Band is to be kept faſt above the Elbow by ſeveral Turns, in this it is to be faſtened round the Arm. The Blood muſt be ſtop'd in the firſt Dreſſing; for afterwards it may be ſtop'd by making ſeveral Turns round the upper Part of the Arm only.

Directions for the Operation of the Suture, or Stitching of a Tendon. By Monſieur Le Clerc, &c.

Firſt, a ſtrait Needle, threaded with a double Wax Thread, with a Knot at the End. A Servant muſt take hold with one Extremity of the Tendon with the *Forceps*, and the Chirurgeon of the other with his Left Hand, whilſt with the Needle and Thread in his Right he pierces or ſtitches from without inwards, ſo as to bring the two Extremities of the Tendon one over the other.

Secondly, a ſmall Compreſs with two Holes in it, thro' which are to be conveyed the End of the Thread to make a ſimple Knot on it. It muſt be dip'd in ſome Balſam or ſpirituous Liquid before you apply it.

Thirdly, a ſmall Compreſs dip'd in the ſame Liquors, and to be laid over the former. On theſe you muſt firſt make the Chirurgeon's Knot, and then the Slip-Knot, and over the Knots put a Bit of Wax, to prevent their Rolling too ſoon.

Immediately after the Suture is made, you muſte bathe the firſt Day the Tendon with Oil beaten up with Spirit of Wine, and afterwards apply a Mixture of Turpentine, Spirit of Wine, Tincture of *Aloes*, and *St. John's-Wort*.

You may alſo in the Beginning apply Cataplaſms made of the four Meals, Yolks of Eggs, and Honey.

Fourthly, a Pledgit made of Lint dip'd in ſome Balſam, and to be apply'd over the Suture.

Fifthly, a ſmall Compreſs to be laid over the Pledgit.

Sixthly, a ſmall Band with one Head, wherewith to make ſeveral Turns round the Dreſſings.

Directions for the Dreſſings for the Diſlocation of the Wriſt. By Monſieur Le Clerc, &c.

Firſt, a Band with one Head of Six Ells in Length, and an Inch and a half in Breadth. Begin with the End of the Roller to make three Turns round the Luxation, then carry the Band over the Root of the Thumb, and next, betwixt the Thumb and Fore-Finger, paſs it round the Thumb, ſo as to make an X round the Bottom of it; carry it down over the Wriſt with ſmall Edgings, and ſo cover the diſlocated Part.

Secondly, Paſtboards to be dip'd in *Oxycrate* as well as the Band, and to be applied on the Sides of the Wriſt: They muſt be of ſuch a Bigneſs as to encompaſs the Arm without touching it, and about Six Inches long, rounded at the Ends.

The remaining Part of the Band muſt be carried ſo often about the Paſtboard till they are covered with Edgings.

Thirdly, a ſmall Ball of Cloth to be put within the Patient's Hand, to keep the Fingers in a middle Poſture; after which you muſt bring the Remainder of the Band over the Ball, and then run up with Edgings the whole Length of the Fore-Arm; and then, with ſeveral Turns above the Elbow, without covering it, faſten the Band.

Fourthly, a Napkin, Piece of Cloth or Silk, to make a Scarf to ſupport the Patient's Arm, leſt by ſtirring it ſhould ſlip out again.

An Abſtract of Mr. Peter Adrian Verduin's *Tract, called,* A New Method of Amputation of Members. *Written originally in* Low-Dutch; *and now tranſlated from the* French.

THat I may proceed in a Thing of ſuch great Moment with all poſſible Order, and in due Method, I will firſt of all give you a Deſcription of the Inſtruments I make uſe of in this new Operation of the Amputation of Members, being almoſt every one of them of my own Invention, or at leaſt much amended.

In the Second Place, I will ſhew you the Manner of the Operation; what is to be obſerved, and how they are to be applied in the Operation.

Thirdly, I will repreſent to you the Advantage and Benefit that ariſes from this new Operation.

And that nothing might be wanting to render the whole as perſpicuous as poſſibly could be, I have cauſed ſeveral Plates to be engraven, to repreſent to your View every Thing that appertains towards the Accompliſhment of this manual Operation; which you may ſee at the End of this Tract.

For you will ſtand in need of various Sorts of Inſtruments, as well in Reſpect of their Materials, as in Reference to the Time when they are to be applied.

In Reſpect to the Materials, ſome are of Leather, others of Iron or Steel, or ſome other ſuch-like Matter; and in Reference of the Time, ſome muſt be applied during the Operation, ſome after it, and others again after the Cure is finiſhed.

During the Operation,

You muſt be provided with a Piece of Calves Leather of about the Breadth of Six Inches, leſs or more, according to the Bulk of the Thigh of the Party that is to have his Leg cut off. This Piece of Leather is with its inferior Part to reach to the Knee-pan, where it is to be faſtened together by Means of three ſmall Straps, which are to be drawn thro' three Braſs Plates or Buckles, with three Holes in them, where they are to be faſtened by the Help of as many Tongues. This Piece of Leather muſt alſo on its anterior Part be provided with two other Straps of about two Foot long, and an Inch broad, with two Buckles, which are placed upon the ſuperior Part of the *Rotula* or Knee-pan, betwixt the two Straps; as may be ſeen in the Firſt and Second Figure of the firſt Plate.

Secondly, a Plate of Braſs, or ſome other malleable Mettal, which muſt be round and concave, of a ſufficient Bigneſs to cover the whole Circumference of the mutilated Part, and even ſo as to reach above a good Inch, or two Fingers breadth, beyond it. Its Figure you ſee repreſented in the Fourth Figure of the firſt Plate.

Thirdly, a Strap of the ſame Leather as the former, of the Length of three Feet, and the Breadth of about an Inch, according to the Bigneſs of the Leg, with a Buckle at one End, and with many ſmall Holes at a ſmall Diſtance from one another at the other End. As you ſee it repreſented in the Seventh Figure of the Second Plate.

Fourthly, Six Tongues or pointed Wires wherewith to faſten or cloſe together the whole Engine, and the Straps. I do ſo them apart from the Buckles, that the Strap may be the eaſier looſen'd, and to avoi drawing the Engine cloſer or harder together tha

than is required, which cannot be ſo well done, in caſe theſe Tongues were faſten'd to the Buckle. Their Figure you may ſee repreſented in the Third Figure of the Firſt Plate.

Fifthly, Two oblong Compreſſes, which muſt be very thick, of the Breadth of about Three Inches, and of the Length of about an *Empan*; as you may ſee it repreſented in the Second Figure of the Second Plate.

Sixthly, a large Compreſs, laid Four doubled together, larger than the Calves-Leather Engine, which incloſes the Thigh; as it is repreſented in the Third Figure of the Second Plate.

Seventhly, a Ribbon or String made of Thread, which muſt be very ſtrong, and of about an Inch and a half broad, and a Yard and a quarter long. You will find it repreſented in the Fifth Figure of the Second Plate.

Eighthly, a ſmall Stick, about an Inch thick, and half a Foot long. This is intended to twiſt the before-mentioned String together. You may ſee it repreſented in the Sixth Figure of the Second Plate.

Ninthly, you muſt be provided with Two or Three Oxen-Bladders, one whereof muſt be made ſoft with warm Water; as you ſee them repreſented in the Twelfth Figure of the Second Plate.

Tenthly, Three Bands or Rollers, of about Two Inches broad, and of the Length of Three *Empans*, which muſt be covered with ſome Emplaſter that will ſtick cloſe, as the *Emplaſtrum Diachalciteoli*, with a ſmall Quantity of Turpentine, and ſplit or cut in Two at one End; as you ſee it repreſented in the Thirteenth Figure of the Second Plate.

Eleventhly, you muſt be provided with ſome *Veſſe de Loup*, which is a Kind of *Champignon*, cut or ſlit, of the Thickneſs of the Breadth of a Finger; as alſo with Shavings of Linen, and Linen to make Pledgits of them; as you ſee them repreſented in the Ninth, Tenth, and Eleventh Figures of the Second Plate.

Twelfthly, you muſt have at Hand a good Quantity of Linen Cloth, whereof you are to make Emplaſters, Compreſſes, and Rollers, of which you will ſtand in need; as you may ſee in the above-mentioned Figures.

Thirteenthly, a ſoft Spunge, in a Diſh or Baſon with warm Water; as you may ſee in the Eighth Figure of the Second Plate.

Fourteenthly, a curved or crooked Knife, very keen, and double ſharp Edged. The Second and Fifth Figures of the Fourth Plate do repreſent to you Two of theſe Knives of a different Size.

Fifteenthly, a Separatory-Knife, for ſuch as have a Mind to make Uſe of it; as repreſented in the Third Figure of the Fourth Plate.

Sixteenthly, Two Saws, the Blades whereof are very thin, and their Teeth very ſharp-pointed; as you ſee them repreſented in the Firſt and Fourth Figures of the Fourth Plate. The bigger of the Two is for the Leg, and the other leſſer for the leſſer Members.

After the Operation, and the Removal of the Firſt Dreſſing;

You muſt have an Inſtrument to keep on the Fleſh that hangs over the ſuperior Part thereof, and muſt be provided with a Piece of ſoft Woollen Cloth, or a double Linen Cloth, in order to apply it to the inferior and poſterior Part of the Thigh; and that the other Part may ſupport that Part of the Fleſh which is turn'd over the Stump, after it is cover'd with a good Compreſs. You will find it repreſented, both entire and taken aſunder in its different Pieces, in the Fifth Plate.

The ſame Plate alſo repreſents to you the Cloth, the Compreſſes, and the Rollers, which are required for the due Application of this Inſtrument.

The Figures 1, 2, 3, 4, and 5, in the Sixth Plate, do ſhew you the true Method how to uſe and apply them; as alſo the right Way how to dreſs the Wound.

After the Cure is fully accompliſhed;

You muſt be provided with an artificial Leg made of Wood, or ſome other light Materials, a ſmall Bolſter *de Chamois*, ſtuff'd with good *Uvet*, for the Support of the *Mignon*; as you ſee them repreſented in the Second Figure of the Seventh Plate.

And laſtly, a Pouch or *Etui de Chamois*, ſuch as may be adapted to the Bulk and Thickneſs of the Knee and of the Thigh;

as you ſee it repreſented in the Sixth Figure of the ſame Plate.

Hitherto I have given you an Account of every Thing that I thought neceſſary for the Accompliſhment of this Operation; but if, after all this, any one that is a proper Judge in theſe Affairs ſhould find in them either ſomething that is defective or elſe ſuperfluous, I ſhall be ready at all Times to make ſuch Alterations in this Reſpect, as ſhall be propoſed and found uſeful and reaſonable. 'Tis to be obſerved alſo, that whenever you are to go about this Operation, you muſt diſpoſe and manage all theſe before-mentioned Things according to the Circumſtances and Condition of the Perſons, Time, and Place. I will now, without any further Preamble, proceed to repreſent to you the Method how to make Uſe of them, and that as briefly, and in as perſpicuous a Manner, as the Nature of the Thing will admit of.

Whenever a Chirurgeon is called to perform the Amputation of a Leg, he muſt, before all other Things, examine the Strength of the Patient, in order to judge accordingly, whether he be in a Condition to undergo this Operation; and in the next Place, the affected Part, which the more fleſhy and entire it is, the more fit it is for the Amputation.

He ought further to take this as a general Rule, never to take off a Leg that is all over ſeized with a *Sphacælus*, or quite corrupted by ſome other Diſeaſe, becauſe the Operation would be in vain; but this Operation may be attempted upon Perſons of a good Conſtitution, whoſe Legs are otherwiſe in a good Condition.

The Patient therefore being placed in a Chair, or upon the Edge of a Bed, againſt the Light, with his Thigh bare, you muſt firſt of all apply one of the before-mentioned Compreſſes in the hollow Part of the Knee, betwixt the Tendons of the Flexors of the Leg; and the other on the interior Side of the Thigh, where the large Veſſels are placed. You may cover them and the Knee with a fine Piece of Linen Cloth four-doubled, and tie or faſten them ſlightly with a Roller, to keep them in their Places.

Over this Linen you muſt apply the Leather Engine pretty cloſe, by the Help of its Three Straps and the Tongues, and that on the Outſide of the Thigh. Over all this you muſt put the String of Thread, which is to be twiſted round by the Hands of a Servant, in order to cauſe a Conſtriction upon the Veſſels during the Operation, as much as ſhall be found neceſſary.

If you find the Thigh to be ſo brawny or large, that the Veſſels are not eaſily to be preſs'd together, you may apply a Second twiſted String.

Things being thus diſpoſed, you muſt turn back or upward to the Thigh as much of the Leather Engine as hangs over the Knee, together with its large Straps, that they may not be in the Chirurgeon's Way whilſt he is performing the Operation.

After this, you muſt make a Ligature with a ſlender Band of Leather, very ſtreight over the Leg, a little above that Part or Place where the Amputation is to be made. Two Servants that are undaunted and ſtrong muſt keep or hold the Leg ſteady and immoveable, by graſping it with both their Hands, one betwixt the Knee and the Ligature, and the other near the *Malleolus*.

After you have with your Left Hand ſtrongly taken Hold of the thick Part of the Leg that is below the Ligature, you muſt with your Right Hand thruſt the Point of your curved Knife quite into it, and let it come out again at the other End, ſo near to the Bone as not to miſs or leave behind you the leaſt Part of the Fleſh, and thus at one Stroak or Cut run it down as far as near to the Tendon of *Achilles*; after this you muſt cut tranſverſedly over the fore Part of the Bone the Skin and the Fleſh, as it is practiſed in the common Amputations, but ſo as at the ſame Time to ſeparate the *Periofteum*, and what you find betwixt the Two Bones.

After you have taken off or turn'd backwards what was left of the Fat, you muſt then ſaw off the Bone, and with a ſoft Spunge dipp'd in warm Water cleanſe the Wound nimbly, that no Shiver of a Bone or any Thing may be left behind, that is likely to hinder its Conſolidation. This done you muſt take off the Ligature, and turn that Portion of the Fleſh over the mutilated Part which was preſerved for that Purpoſe. This you muſt adapt well to the mutilated Place, by preſſing with your Hands up

it, and thruſting it from the back Part of the Leg forward: Then you muſt provide the Lips or Edges of the Wound with *Champignon*, Lints, Stupes, or with ſome other proper Adſtringent (but a ſmall Quantity is ſufficient); and then ſurround or wind about the whole Stump with the beforementioned Ox's Bladder, ſoftened with warm Water, and faſten'd with a Roller, beſmear'd with ſome ſticking Plaiſter. If there be Occaſion, you may apply a Second Bladder.

The Wound being thus dreſs'd, you muſt put into its former Place that End of the Leathern Engine, together with its Straps, which was turned upward upon the Thigh before, cover the *Mignon* with a good Compreſs, and over that apply the concave Plate, and preſs it on as hard as is requiſite to ſtop the Bleeding, by the Help of the Two great Straps, which you muſt bring over it in Form of a Croſs of *Burgundy*, and then faſten them to their Buckles by the Means of the Tongues, by which Application the Flux of the Blood, though never ſo great, will be ſtopp'd.

The Third Plate does ſhew you exactly how to manage this Dreſſing; and for fear the large Straps ſhould ſlip out of their Places, which would occaſion a Flux of Blood, or ſome other ill Accident, I moſt commonly bind a ſmall circular Roller over them.

This done, you muſt now looſen or remove the twiſted String, unleſs there ſhould be ſome Danger of a new Flux of Blood, which I have never obſerved to have happened upon the Uſe of my Engine, even in the common Way of Amputation, where elſe it is greater than ordinary.

If this Engine ſhould happen to make too cloſe a Compreſſion upon the Thigh, or the Plate upon the *Mignon*, it is eaſie to looſen a little, by drawing out the Tongues or ſmall Pins, and putting them one or two Holes more backwards, which is not to be done in the common Bandages; but you had better ſtay ſome Hours after the Operation before you go about to looſen them.

This is the Method of my own Invention for the Amputation of Legs, when there is no Hopes of their Preſervation or Cure otherwiſe: And I do not in the leaſt queſtion but that the ſame may take Place likewiſe in the Amputation of an Arm or Thigh, provided the Chirurgeon does not want Prudence and Experience to diſpoſe every Thing that is neceſſary, ſo as to accommodate them to the Condition and Circumſtances of the Part where the Amputation is to be made.

I confeſs I have treated this Matter with all imaginable Brevity; yet ſo, as to be mindful alſo of Perſpicuity: And if any Thing may not ſeem to be very intelligible at firſt Sight, the Cuts or Figures will doubtleſs make it ſufficiently plain and obvious.

So that having communicated to you a new and the beſt Method (as far as I know) that has been made publick hitherto, as well in Reſpect to the Application of the Inſtruments, as to the Dreſſings of thoſe Sorts of Wounds, it would perhaps be uſeleſs to ſay any Thing more upon this Head; but conſidering that this Tract may fall into the Hands not only of old and experienc'd Maſters, but alſo in thoſe of young and not fully experienc'd Chirurgeons, I cannot forbear to adviſe them, in order to procure a kind Conſolidation in theſe Wounds, to manage them with a great deal of Precaution, that the Fleſh that is to be applied to the Bone may not be wounded in any Manner of Way, leſt it ſhould cauſe an Abſceſs; but it muſt be kept gently to it till its entire Reunion with the Bone be procur'd.

For this Purpoſe I have invented alſo an Inſtrument, which you ſee repreſented in the Fifth Plate, and its Uſe in the Firſt Figure of the Sixth Plate. This Inſtrument is to be applied after the Firſt Dreſſing is taken off, in order to keep the Parts that are united together, ſo as to leave the Edges of the Wound open, for the Conveniency of Dreſſing it.

This Inſtrument, which I will call the *Supporter*, conſiſts of Two Parts; the Firſt is a Piece of Tin, or of thin Leather, concave within, in order to embrace one Half of the Circumference of the Thigh, a little ſlit on its interior and inferior Part, with a ſmall *Guaine* of the ſame Materials at its Extremity; unto the Middle of which is to be faſten'd an *Ecrove*, to keep the *Vis* firm and ſteady.

This

This *Guaine* muſt be applied obliquely under the hollow Part of the Knee, in order to receive the End of the other Part, which is round and hollow, which you muſt make to enter within it, by thruſting it gently towards the *Mignon*, till you find it to ſupport as much as is requiſite: As you may ſee it expreſſed in the Firſt, Second, Third, and Fourth Figures of the Fifth Plate.

To apply this Inſtrument as conveniently as may be, you muſt line it within with a Piece of Woollen Stuff, or double Linen Cloth, and then apply it to the poſterior Part of the Thigh, but ſo, as that the *Guaine* may ſupport the Stump underneath. After this you muſt faſten it by the Help of a Roller to the Thigh, and with another Roller the *Guaine* to the Stump.

To make the End and the round Part enter into the *Guaine*, as we told you before, and when it is near enough to the *Mignon*, to keep it on cloſe without Pain, you muſt faſten it with the *Vis*, which muſt be put into its poſterior Part. By the Means of this Inſtrument, the Fleſh which comes or reaches over the Bone is kept cloſe to it, when you open the Dreſſing in order to dreſs the Wound afreſh; as you may ſee it plainly repreſented in the Firſt Figure of the Sixth Plate, where it is fully repreſented.

It would be ſuperfluous to enlarge here upon what Remedies are proper for the Conſolidation of theſe Sorts of Wounds, becauſe ſuch as have but the leaſt Knowledge in Chirurgery, are not unacquainted how to cure a freſh Wound; and therefore I will only add ſomething here concerning the Conveniencies and Benefit of this new Method.

The chiefeſt are, the great Flux of Blood, which elſe is unavoidable, and which not only much weakens the Patients, but ſometimes alſo bring them to the Brink of the Grave, is hereby prevented, as likewiſe a Gangrene, which often enſues upon the common Operation.

'Tis for theſe Two Reaſons that I ſaw my ſelf obliged a conſiderable Time ago to reject in the Amputation the Uſe of the ancient Bandages, with an Intention to pitch upon one that might be both more ſecure and more commodious: For what can be imagined either more dangerous, or more incommodious, than that Conſtriction made by thoſe long Rollers, which cannot be drawn together, nor looſened, according as Neceſſity requires? So that in caſe this Compreſſion is exceſſive, it may eaſily cauſe a Gangrene; but if the Bandage be too looſe, a Flux of the Blood will enſue.

Theſe Two Evils are eaſily avoided by the Help of the Two before-mentioned large Straps of my Engine and my Plate; for by the Application of one Piece of Fleſh over or upon another, the Orifices of the Veſſels, which were open before, are cloſed up by the Fleſh it ſelf.

We reap another conſiderable Advantage likewiſe by this new Method, which is, That the Chirurgeon never meets with any Stop or Check in the Cure by the Shivers of Bones, which are often ſeparated in the ancient Way of Amputation, and which either hindered or retarded the Cure; whereas on the contrary, in our Operation, notwithſtanding the Bone is impaired both by the Air and by the Saw, there is not the leaſt Fear of an Exfoliation. I ſpeak this upon my own Experience, in Oppoſition to thoſe who aſſert, That all the Bones that are laid bare, muſt of Neceſſity exfoliate.

But what is beſides this moſt of all worth our Admiration, and which will ſcarce be admitted without ſome Contradiction, is, that the large Piece of Fleſh which is brought over the Stump of the Bone, might ſeem to be likely to cauſe ſome Inconveniency there by its own Bulk: But here I muſt give you this Precaution, not to cut off the leaſt Piece of this Fleſh; for its Extremities will ſufficiently contract themſelves in ſuch a Manner, that you will not find too much of it, and that the *Cicatrix* which will remain upon the anterior Part of the Stump, will be very ſmall; as you may obſerve it in the Sixth Figure of the Sixth Plate.

From this beforeſaid Advantage ariſes a Third very conſiderable Benefit to the Patient, which is, that you may with much better Conveniency fit a wooden Leg to the Stump after this Manner of Amputation, or a Leg made of ſome other light Materials, ſo as that you may wear a Stocking and a Shooe over it, which as it very nearly imi-

Tab.

Plate 1.

Fig: 1.

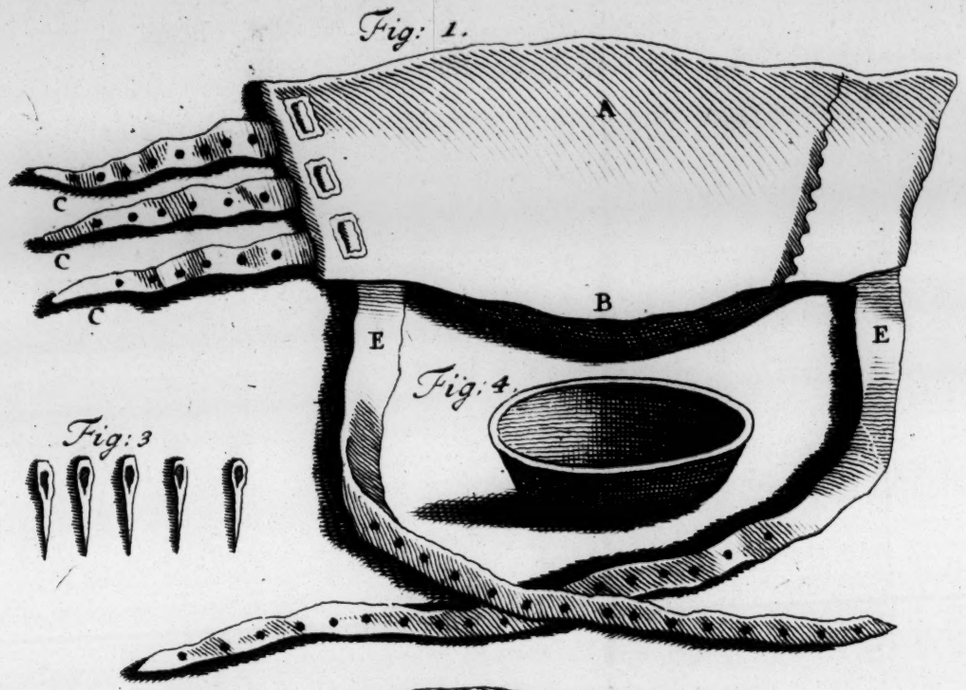


Fig: 3

Fig: 4.

Fig: 2.

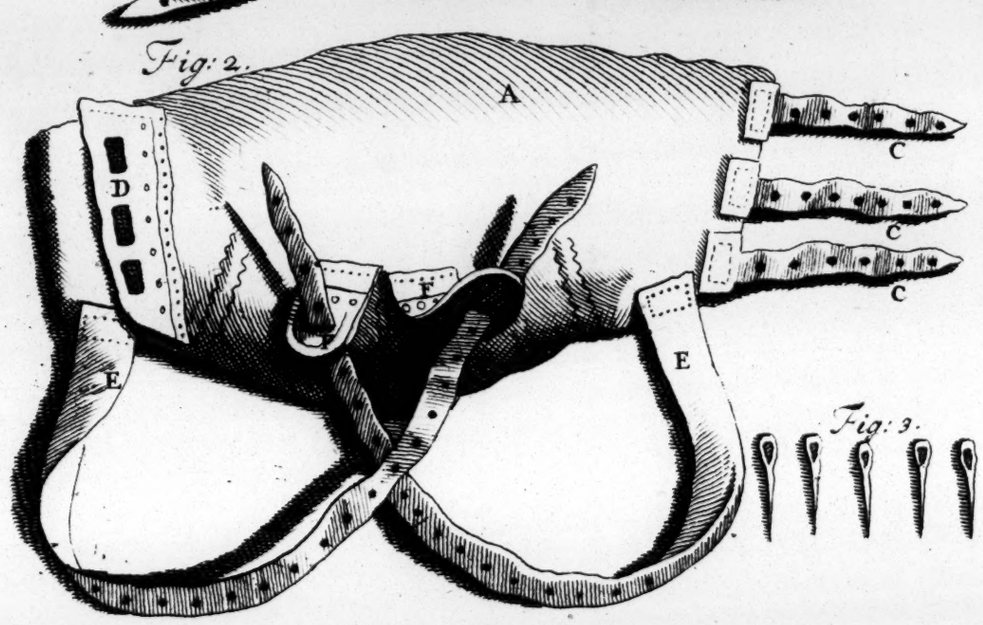


Fig: 3.

Plate 2.

Fig: 7.

Fig: 14

Fig: 5

Fig: 6

Fig: 4

Fig: 12

Fig: 9.

Fig: 10

Fig: 13

Fig: 11.

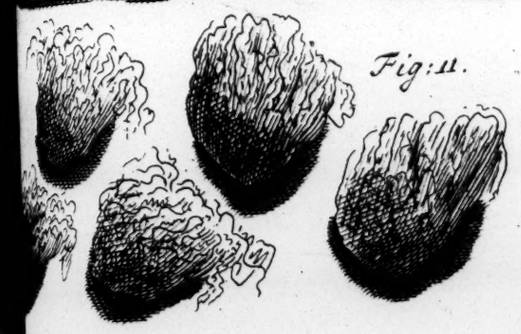


Fig: 1.

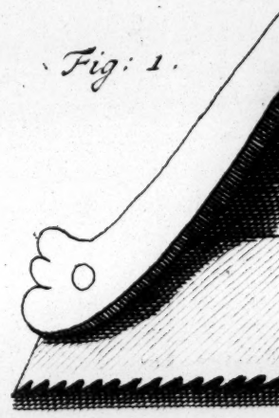


Plate 3

Fig: 1

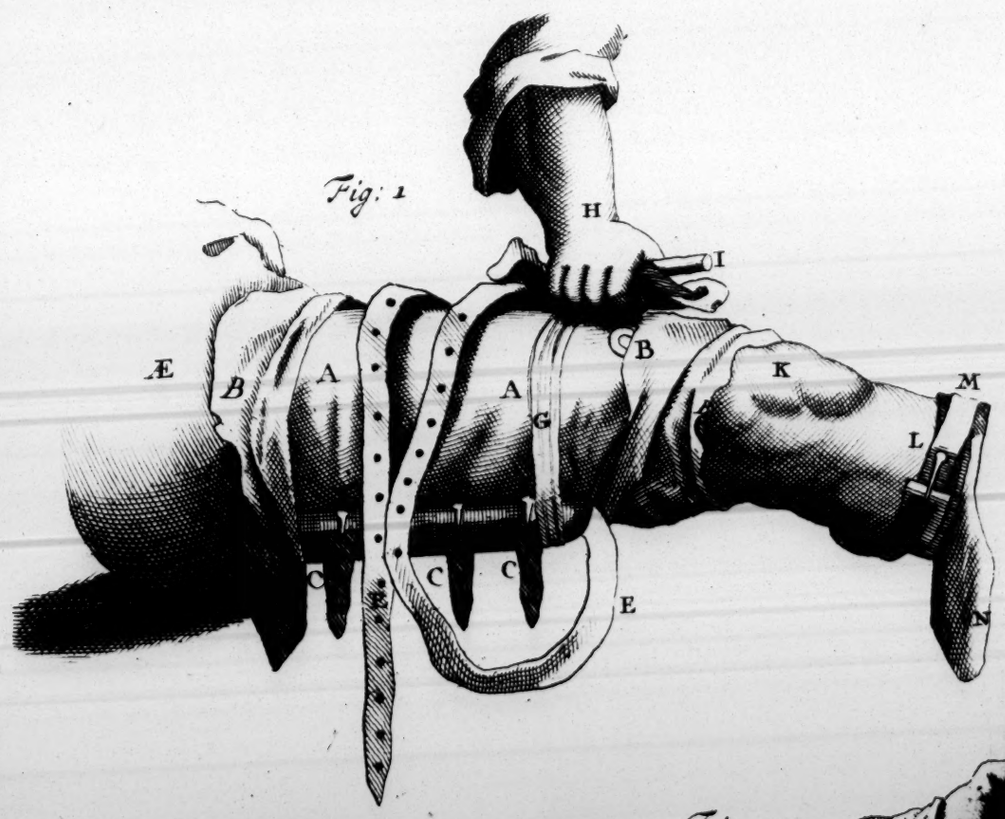


Fig: 4

Fig: 2

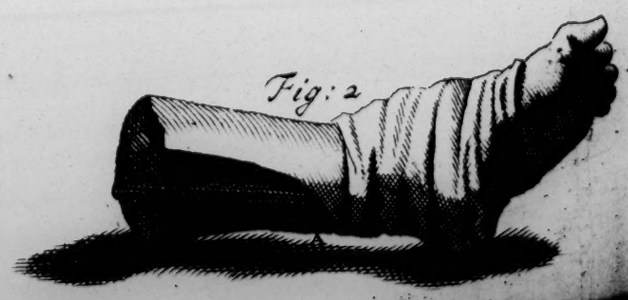


Fig: 2.

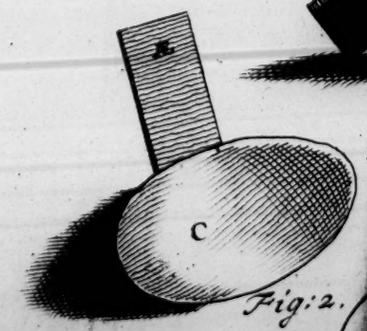


Fig: 5.

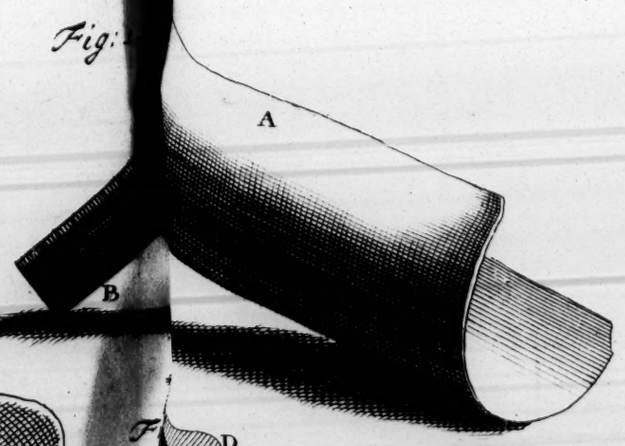


Fig: 5

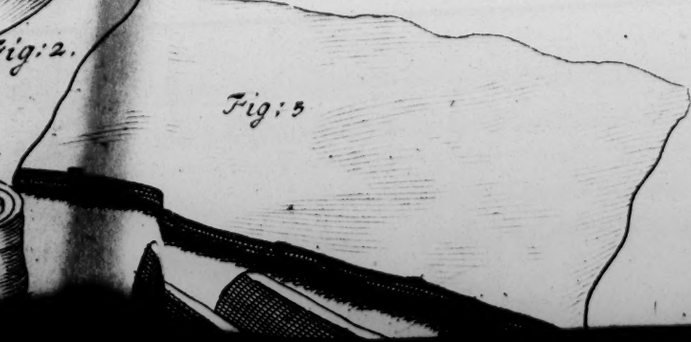
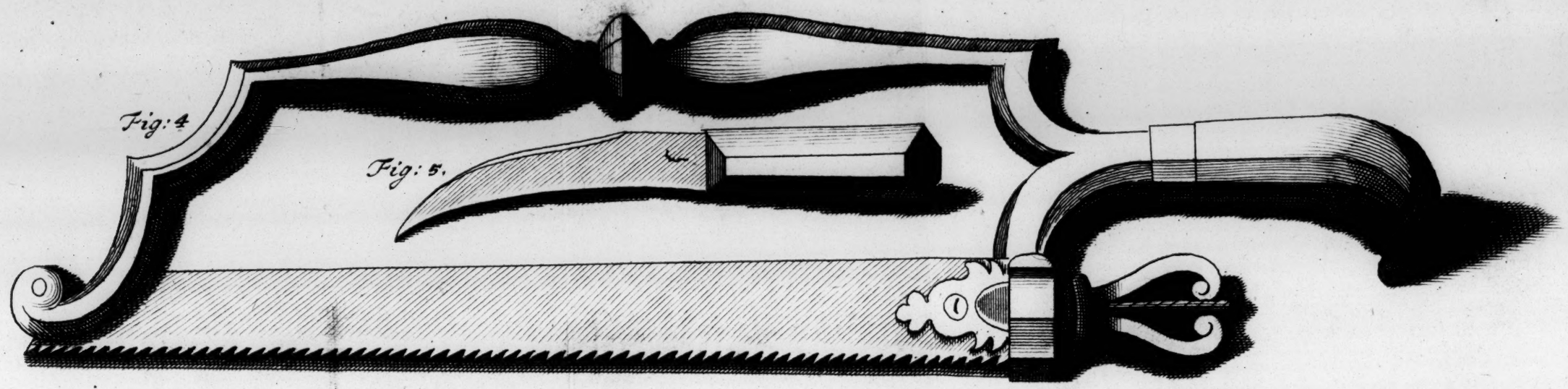
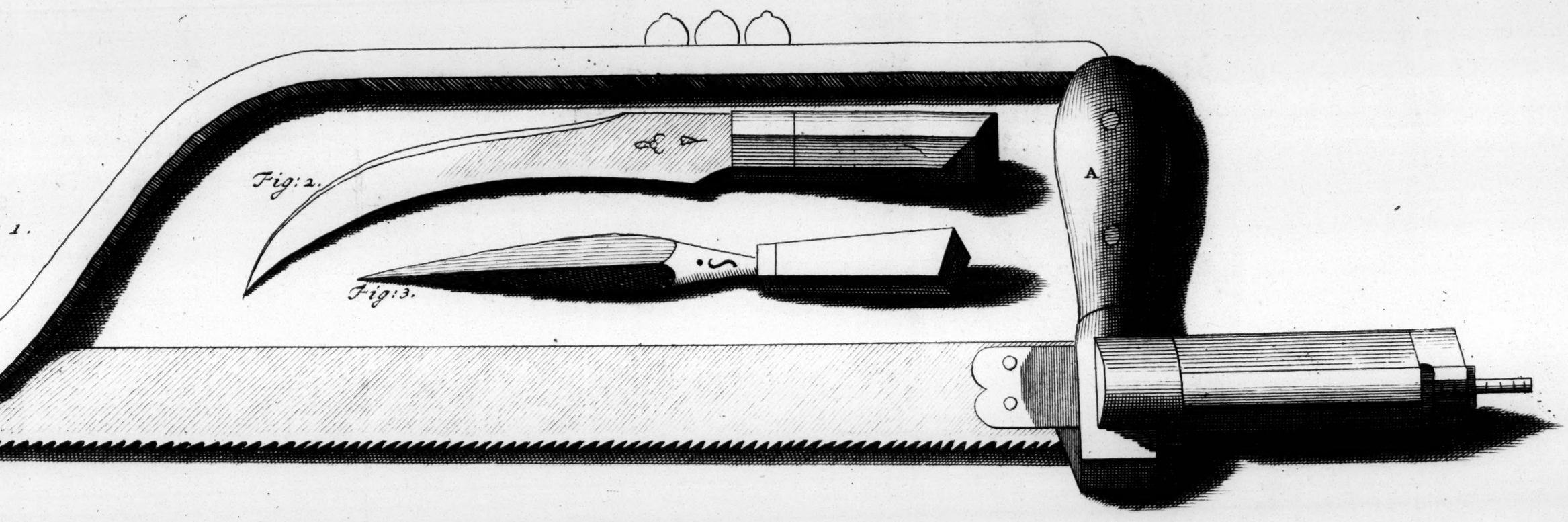


Fig: 7.

Plate 4.





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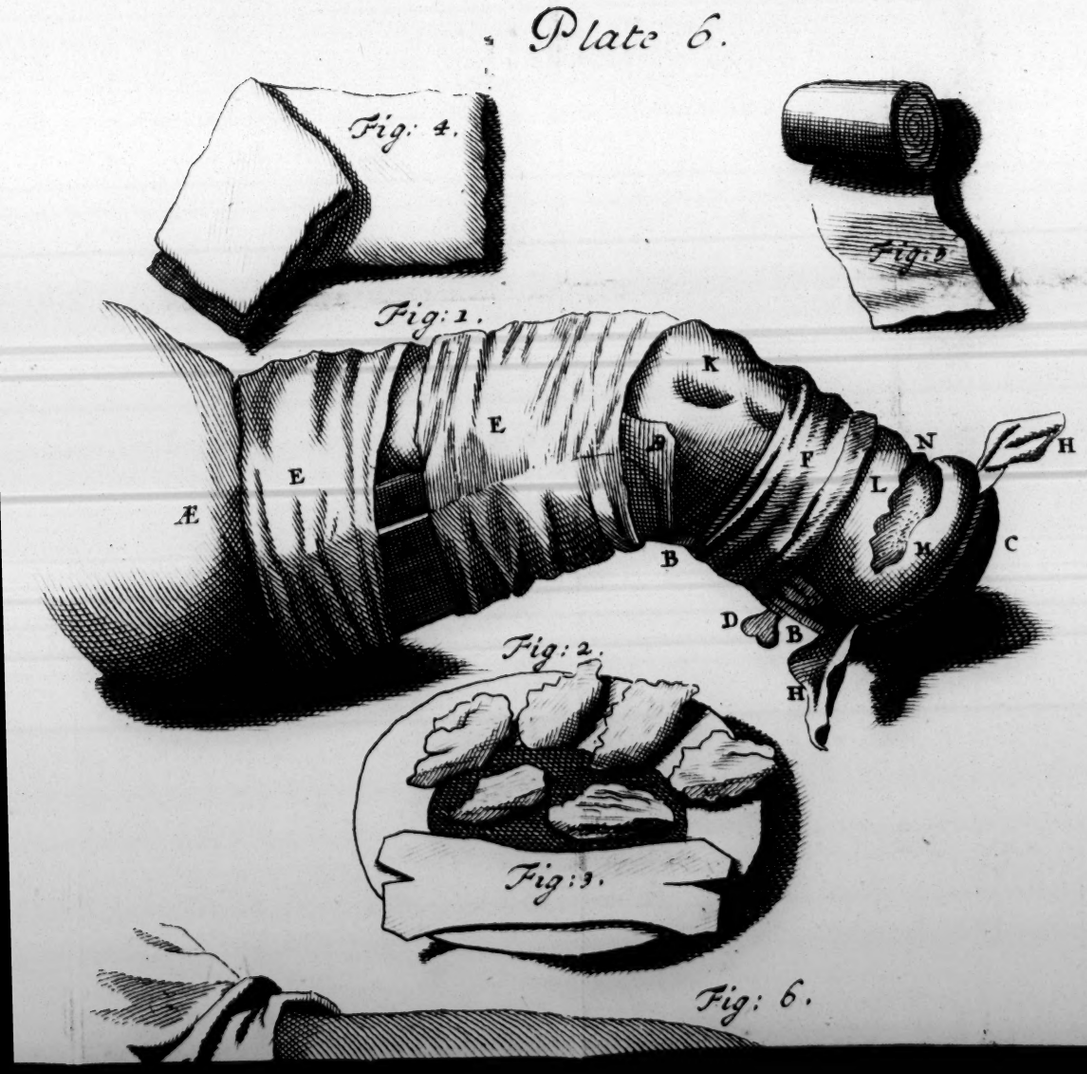
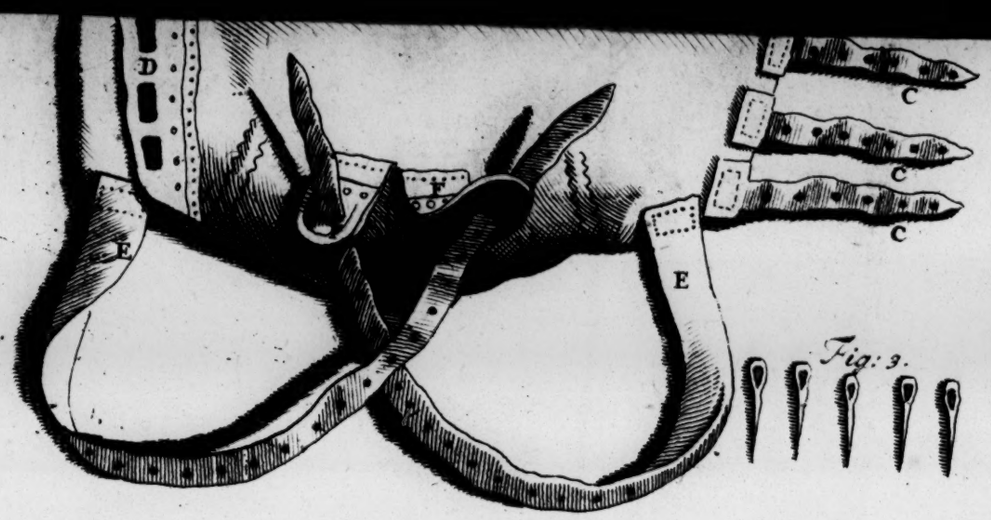
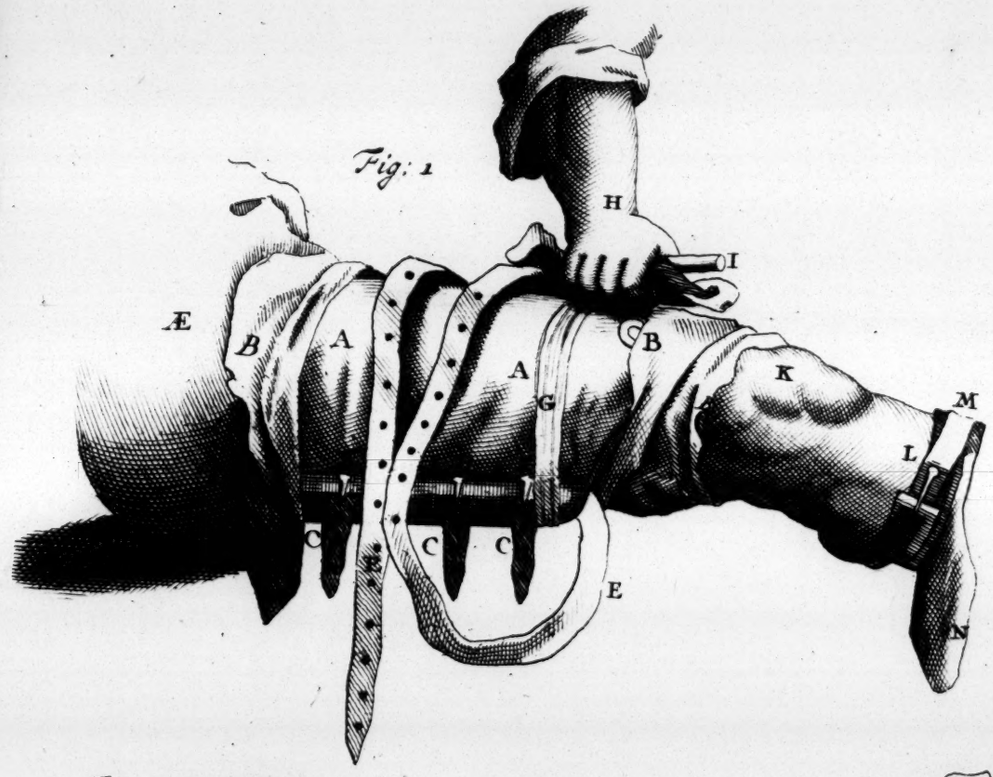
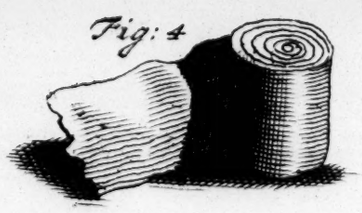


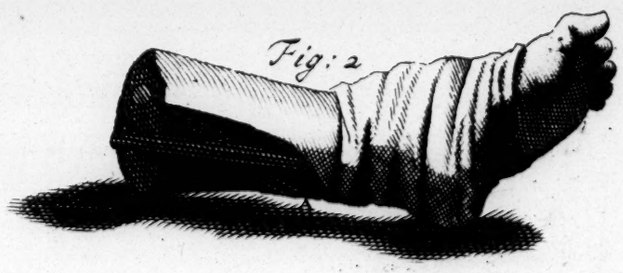
Plate 7

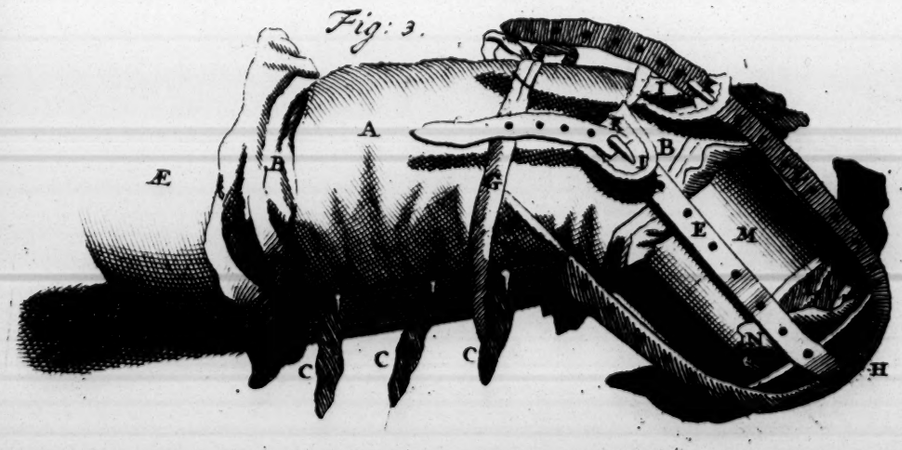
Plate 3

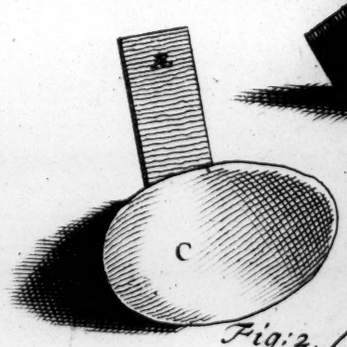


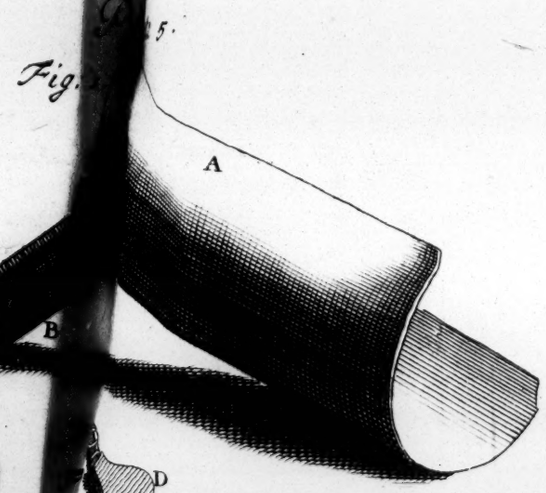


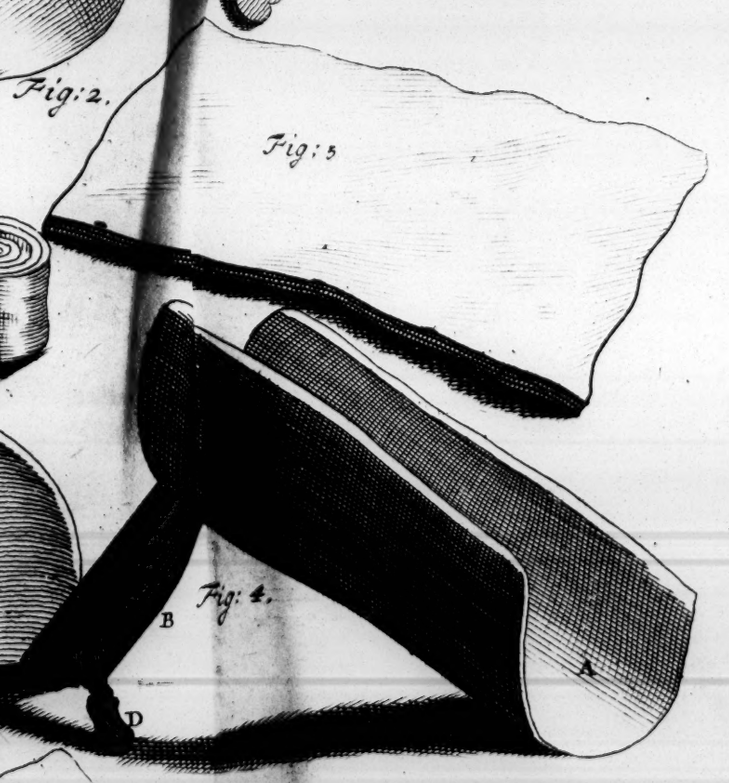


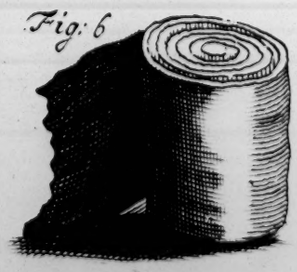












Mons.r Verduin; Cheif Chirurgeon att Amsterdam his new way of Amputation Presented to Mons.r Witsen

Fig: 1.

Fig: 2.

Fig: 3.

A

Plate 6.

Fig: 4.

Fig: 5.

Fig: 1.

Æ E E E K F L N H B H C D B H

Fig: 2.

Fig: 3.

Fig: 6.

A B C E D

Fig: 7.

Plate 7

Fig: 3.

Fig: 1.

F H C B D A E G

Fig: 2.

Witsen Burgom.r of Amsterdam and Ambassador to King William the 3d. in seven plates

fates a natural Leg in its Shape, ſo it does the ſame in Walking; and upon this Score I muſt give you this Caution alſo, the longer you let the Stump alone, the better and the more ſteady the artificial Leg may be fitted to it, without any Regard to or Fear of Inconveniency from the Fleſh that is drawn or brought over the Bone; ſo that the Patient may reſt upon it very commodiouſly, and without Pain, the Motion of the Knee being not impaired; provided you take Care to ſtir it from Time to Time during the Cure.

Laſtly, I neither can nor ought I to paſs by in Silence another great Advantage which the Patients reap from this new-invented Amputation, and which ought to be highly valued; which is, that ſuch Perſons as are treated and cured according to this new Method, are never diſturbed with the Sympathetick Pains in the Foot, or Part of the Leg that is cut off, which elſe afflict and diſturb the Patients to the higheſt Degree, even for a long Time after the Operation is over.

I can aſſert this again upon my own Experience, and am willing to prove it by the following Hiſtory.

'A certain Perſon, who had his Leg cut 'off at Sea, and who had too long a Stump 'left, was very frequently afflicted with 'exceſſive and moſt troubleſome Pains, 'which ſeemed to be in that Part of the 'Foot or Leg that was taken off by Ampu-'tation; which encreaſing to a moſt vio-'lent Degree, made him take a Reſolution 'to be rid of it at any Rate, and ſo reſolved 'to undergo a Second Amputation, accor-'ding to my Method. The ſame being 'made purſuant to his Deſire, he was ſoon 'delivered of theſe vexatious and violent 'Pains he found himſelf ſubject to before, 'and is able to walk ſince that Time with-'out any Pain, or any other Inconveniency.

To give you my Opinion concerning this Phenomenon, I am apt to believe, That the Extremities of the Nerves, when cut aſunder after the common Way of Amputation, being covered only with a ſlight *Cicatrix*, and conſequently expoſed to the leaſt Injuries of the Air, or any other Things, are ſoon made ſenſible of a Motion there: Upon which it happens immediately, by the Reflux of the Animal Spirits from the Brain, that they produce a new Perception or Senſe of the old Pain which the Patient was uſed to feel before; which cannot happen thus after the Extremities of the Nerves are very cloſely covered by ſuch a bulky Maſs of Fleſh; which is beſides this of ſingular Advantage to the Patient, becauſe this is the only Reaſon why he is able to reſt ſo firmly and without Pain upon the *Mignon*.

I will not pretend to enlarge any further upon this Head; but will only add this by Way of Confirmation of what I have ſaid, That the ſingular Succeſs I have met with in various Amputations of this Nature, has invited the Chirurgeons of the Hoſpital of this City to make Uſe of it alſo, which they have done, among others, with great Succeſs upon a Perſon of Thirty Years of Age, who walks and bends his Knee as freely, and with the ſame Eaſe, that it is hard to diſtinguiſh which of the Two is the Leg that has been cut off. The Figure you may ſee in the Seventh Plate.

The Explanation of the FIGURES *belonging to the Firſt Plate.*

Figure I. & II. *repreſent the interior and exterior Surface of the Leathern Bandage, or Engine, which is to be applied to the lower Part of the Thigh, and upon the Knee.*

The Firſt Figure mark'd with *A*, is the interior Surface of the ſaid Bandage, which is to be applied to the Thigh.

B, is that Part which is to be applied to the Knee.

The Second Figure mark'd with *A*, ſhews the exterior Surface of that Part which is to be applied to the Thigh.

B, ſhews the external Surface of that Part which is to cover the Knee.

In the Firſt and Second Figures, the Three Letters *C*, *C*, *C*, repreſent Three Straps, which

which are to faſten this Engine under the Bending of the Knee.

The Letter *D*, in the Second Figure, ſhews the Buckle, with Three oblong Holes, to receive the ſaid Straps.

E, E, in the Firſt and Second Figures, do repreſent Two Straps, by which the concave Plate keeps cloſe the *Mignon.*

F, F, in the Second Figure, ſhew Two Buckles, which receive the beforeſaid Straps.

Figure III. *repreſents Five Tongues or Pins, which are to be put through or within the Straps above the Buckles, in order to keep them ſtreight.*

Figure IV. *ſhews the concave Plate, which is to be applied upon the* Mignon.

['Tis to be obſerved, That the Manner of making Uſe of theſe Inſtruments, is repreſented in the Firſt and Third Figures of the Third Plate.]

An Explanation of the FIGURES *repreſented in the Second Plate.*

Figure I. *repreſents the thick Compreſs which is to be applied to the hollow Part of the Knee.*

Figure II. *ſhews another Compreſs which is ſomewhat broader, which is to be applied to the interior Part of the Thigh.*

Figure III. *repreſents the Piece of Linen, or the Compreſs, laid Four-doubled together, which are to ſurround or incloſe the other Compreſſes, the Thigh, and the Knee.*

Figure IV. *ſhews the Roller wherewith to bind the Compreſſes, that they may not ſlip out of their Places.*

Figure V. *ſhews the Fillet, or the String of Thread.*

Figure VI. *ſhews the ſmall Stick wherewithal to twiſt the Fillet or String.*

Figure VII. *repreſents the thin Strap, together with its Buckle, and Tongue or Pin, mark'd with A.*

Figure IX. *ſhews the Pieces of the* Champignon, *call'd the* Vaſſe de Loup.

Figure X. *ſhews the ſmall Compreſſes of Linen, and the Pledgits.*

Figure XI. *ſhews the Pledgits of Stupes.*

Figure XII. *repreſents the Bladders, prepared and mollified with warm Water.*

Figure XIII. *ſhews the Roller of the ſticking Plaiſter, which is ſlit at the End.*

Figure XIV. *ſhews the Compreſs which is to cover the* Mignon, *after all the beforeſaid Dreſſings are laid on.*

An Explanation of the FIGURES *repreſented in the Third Plate.*

Figure I. *repreſents the Thigh, and Part of the Leg, unto which is adherent Part of the Fleſh, which is to be put over the mutilated Part.*

Æ, ſhews a Part of the Thigh.

B, ſhews the Compreſs which covers it.

A, A. The Bandage or Engine which cloſes the hollow Part of the Knee.

B, ſhews that Part of it which covers the Knee, turn'd upwards, together with its Straps.

C, C, C, are the Three Straps which faſten the Bandage or Engine to the Side of the Thigh.

D, repreſents the great Buckle, with Three Holes, which receive the Three Straps.

E, E, are the Two large Staps.

F, F, F, are the Three Tongues or Pins, which faſten the Three Straps.

G, ſhews the Fillet or String of Thread, which is to be twiſted.

H, ſhews the Hand which turns or twiſts the Fillet, with the Stick mark'd with *I.*

I. The ſmall Stick held in the Hand.

K. The

K. The Knee. *L.* Part of the Leg.
M. The ſmall Roller, which binds the Leg ſtreight.
N. That Portion or Part of the thick Part of the Leg which has been preſerved.

Figure II. *repreſents that Part of the Leg which has been taken off by Amputation.*

A, is the Place where the beforeſaid Fleſh has been ſeparated.

Figure III. *repreſents all the Dreſſings applied to the End of the Leg.*

Æ, is the Thigh. *B,* A Piece of Linen Four-doubled.
A, is the Roller which binds the hollow Part of the Knee.
B, is its anterior Part placed upon the Knee.
C, C, C. are the Three Straps.
D. The Braſs Buckle. *E, E, E.* The Three Pins.
G, ſhews the twiſted Fillet looſen'd.
E, E, The Two great Straps, which embrace or paſs over the concave Plate, in the Shape of a Croſs of *Burgundy*. *H.* Applied to the *Mignon.*
H. The concave Plate.
I, I. The Two Buckles, which receive the Two Straps, mark'd with *E, E,* kept cloſe or firm by Means of the Tongues or Pins, mark'd with *K, K.*
K, K. ſhews the Two beforeſaid Pins or Tongues.
L. The Bladder which is to be applied to the *Mignon.*
M. The Roller, with the Sticking-Plaiſter.
N. The Compreſs, which muſt be applied to the *Mignon* before you apply the concave Plate, mark'd with *H.*

Figure IV. *repreſents the Bandage which ſurrounds the large Straps and the Stump, in order to contain every Thing in its proper Place.*

An Explanation of the FIGURES *belonging to the Fourth Plate.*

Figure I. *repreſents the large Saw for the Thigh, or a very thick Leg; with a Handle to it, mark'd with* A. *which I have placed on the poſterior Part of the arched Part, that it may work with the more Expedition.*

Figure II. *repreſents the larger curved Knife, ſharp, and double Edged, which I make Uſe of likewiſe inſtead of a Separatory-Knife.*

Figure III. *ſhews a Separatory-Knife, for thoſe that have a Mind to make Uſe of it.*

Figure IV. *ſhews the ſmaller Saw, for the leſſer Legs or Limbs.*

Figure V. *ſhews the leſſer curved Knifes.*

An Explanation of the FIGURES *repreſented in the Fifth Plate, which ſhews the Inſtrument called the* Supporter, *or the* Retainer, *with all its Appurtenances.*

Figure I. *repreſents the Firſt Part of it, made of Tin, mark'd with* A. *and hollowed, to receive one Half of the Circumference of the Thigh.*

B. The *Guaine,* which is faſten'd to this ſuperior Part.

Figure II. *repreſents the other Part, which is round and concave, and faſten'd to the Prominency Æ, which is to be put into the* Guaine.

Æ. The beforeſaid Prominency.
B. The *Guaine.*
C. That Part of the Extremity or Prominency of which is inchaſed into the *Guaine,* and faſten'd with the *Vis, D.*
D. The beforeſaid *Vis.*

Figure V. *ſhews a Piece of Woollen Stuff, or of Linen Cloth, wherewith to line the Inſtrument before it is applied to the Thigh.*

Figure VI. *ſhews the Roller wherewith it is faſten'd to the Thigh.*

Figure VIII. *ſhews the Compreſs which muſt be put upon the* Mignon, *before you apply the concave Plate to it.*

An Explanation of the FIGURES *belonging to the Sixth Plate.*

Figure I. *ſhews how to uſe the ſaid Inſtrument.*

Æ. The bare Thigh.

B. A Piece of Woollen Cloth, which covers the poſterior Part of the Thigh.

A. The Firſt Part hollowed out, which is to be applied to the Thigh.

B. The *Guaine*, which is faſten'd to it.

C. The concave Plate, which ſupports or keeps on the Fleſh that is brought over the Bone.

D. The *Vis*, which cloſes the Extremity, *Æ*, the Second Figure of the Fifth Plate, when it is with the *Guaine*, and keeps it ſteady and firm.

E, is the Roller, which binds the ſuperior Part to the Thigh.

F. The Roller, which binds the Stump to the *Guaine*.

H. The Compreſs, which covers the *Mignon*.

K. The Knee.

L. That Part of the Leg that is cut off.

M. The Fleſh that is ſeparated, and turn'd over the End of the Stump.

N. The Wound bloody.

Figure II. *repreſents the Pledgits beſmear'd with Unguents, for the covering of the Wound.*

Figure III. *ſhews the Emplaſter, which muſt be plac'd upon it.*

Figure IV. *ſhews the Compreſs, which is to ſurround the Part.*

Figure V. *ſhews the Roller, which is to bind up the whole Part.*

Figure VI. *repreſents the Part abſolutely cured, with the Plaiſters and Rollers taken off.*

A. The Thigh. *B.* The Knee. *C.* The Stump.

D, ſhews the thick Part of the Leg, which is join'd or united with it.

E. The *Cicatrix*, upon the anterior Part of the Leg.

Figure VII. *ſhews the Pouch, or* Etuy de Chamois, *which is to inveſt or cover the Stump of the Thigh.*

An Explanation of the FIGURES *repreſented in the Seventh Plate.*

Figure I. *repreſents an artificial Leg.*

A. The wooden Foot or Leg, with its Shooe and Stocking.

B. The Caſe or *Etuy* of Braſs, ſplit in Two Sides, to give Entrance to the Stump.

C. The Strop, which faſtens the Caſe a little with the Buckle after the Stump is put in.

D. The Place where the Caſe is put over the Wood.

E, E. Two Hoops or Bands of Iron, with Two Pivots, which enter into the Two Ends of the *Cuiſſar*, by Means whereof the Knee bends and extends very commodiouſly.

F, repreſents the *Cuiſſar*, made of a Piece of Iron, having Two Holes wherein it receives the aforeſaid Two Pivots. It muſt have a ſufficient Opening behind, to afford Paſſage to the Thigh; and the ſaid Overture muſt be cloſed up with Two Pieces of Leather, which are to be faſten'd together with a good String or Cord. The whole *Cuiſſar* muſt be lined with Calves-Leather.

G. The *Cordon.*

H. The Place where the Knee is bent and extended.

I. The Pouch, or the *Etuy de Chamois*, which is to cover the Stump and the Thigh.

Figure II. *repreſents the Bolſter ſtuff'd with* Duvet, *which is to be put into the Bottom of the Caſe, the eaſier to ſupport the* Mignon.

Figure III. *repreſents the Patient abſolutely cured, reſting upon the Stump of his Leg.*

And

And here it is to be obſerved, That the artificial Leg as repreſented in the Plate, is not intended to ſerve as a general Model or Pattern; for it may be altered according to the Age, Condition, and Circumſtances of the Patient: As for Inſtance, for ſome People who know how to manage ſuch an artificial Leg with Circumſpection and Dexterity, it may be made of Iron, of Leather, or ſome other proper Materials, which, by the Help of certain Iron Springs, will imitate the Motion of a natural Leg or Foot, and will not appear ſo ſtiff and rigid as thoſe made of Wood do.

It is further adviſed, That ſuch Chirurgeons as will follow the Invention of Mr. *Verduin* in the Amputation of a Leg, ſhould not follow the Directions of ſome, who, after they have taken off the Bone with the Saw, pretend to remove the Aſperities which are made by the Saw upon the Edges by filing, to prevent its wounding the Fleſh, becauſe there will ſoon be formed a *Callus* which will deliver them of that Fear, by ſetling to the mutilated Extremities of the Bone.

A Letter written upon the before related Subject to the Author thereof. By Monſieur William Van Vlooten, *a famous Chirurgeon of* Utrecht.

'SInce you did me the Favour of ſhewing me a Child on which you had made 'the Amputation of a Leg according to 'your new Invention, and ſince you have 'publiſhed your Tract, wherein you have 'given the Publick an Account of that Ope'ration with all poſſible Brevity and Per'ſpicuity, an Occaſion has offered where I 'did put it in Practice, and I ſhould think 'my ſelf altogether unworthy of your 'Friendſhip, ſhould I neglect to communi'cate to you the happy Succeſs that atten'ded and followed the Operation.

'In *September* laſt, a Native of *Nimeguen*, 'called *Iſaac Heyman*, of about Twenty Years 'of Age, was brought to the Hoſpital of 'this City, very lean, and afflicted with a 'lingring Feaver of Three Years ſtanding, 'and divers fiſtulous Ulcers, accompanied 'by a very deep *Caries* in the Bones of the '*Metatarſus*, cauſed by a *Spina Ventoſa*.

'He had been for a conſiderable Time 'under the Hands of ſeveral noted and dex'trous Chirurgeons, but without Succeſs; 'and I my ſelf tried all Means according to 'Art, but in vain: So that ſeeing the Feaver 'to encreaſe, and the Strength of the Patient 'to decreaſe every Day, ſo that (in all Pro'bability) he could not live long under 'theſe Circumſtances, I requeſted the Bur'germaſter *Zeypeſteyn*, and the Profeſſor *Val'lan*, both Phyſicians and Overſeers of this 'Hoſpital, to honour us with their Preſence, 'as likewiſe Mr. *Melcherport*, likewiſe a 'Chirurgeon of this City, who had had 'this Patient in Hand ſome ſmall Time be'fore he was brought to the Hoſpital.

'After having well examined the Condition 'and Circumſtances of the Patient, we a'greed with joint Conſent, that nothing 'but the Amputation of the Member could 'ſave the Patient's Life. The Patient at firſt 'was unwilling, becauſe he was as yet able 'to ſet his Foot a little to the Ground, the '*Tarſus*, and the whole Bone of the *Talus*, 'being ſound as yet: But not long after, 'perceiving his Strength to decreaſe apace, 'he then begged of us to proceed to the Am'putation as ſoon as was poſſible; which 'was done accordingly the laſt 13th of *Ja'nuary*, in the Preſence of the beforelaid 'Phyſicians and Chirurgeons, and divers 'others, as well Phyſicians as Chirurgeons, 'of this City.

'We laboured under ſome Difficulties to 'manage this Amputation according to your 'Directions, becauſe the Patient was quite 'Conſumptive, and the Muſcles of the Leg 'ſo far extenuated, that we thought it al'moſt impoſſible it would be ſufficient to 'cover the mutilated Part: Notwithſtan'ding which, the Benefit that was likely to 'ariſe to the Patient, and great Deſire we 'had to proceed in this Amputation accor'ding to your new Method, were ſufficient 'Motives to us to reſolve upon the Ope'ration.

'Having therefore got all the neceſſary 'Furniture in Readineſs, as well according 'to your as to the ancient Method, the 'Compreſſes were applied to the large Veſ'ſels, the leathern Engine over it, and had

the Fillet or String twiſted ſtrait. We alſo applied the ſmall Strap of Leather upon that Part where the Amputation was to be made, to keep ſtrait the Skin and the Fleſh; but found that it was not ſtrait enough, becauſe it was to have two Circumvolutions about the Leg: But this is of no great Conſequence.

'In Relation to the Separation of the Muſcles which are to cover the *Mignon*, you obſerve with a great deal of Judgment, that you muſt thruſt in the Point of the Knife next unto the Strap, and as near to the Bone as is poſſible, and finiſh at the Extremity of the Muſcles: But conſidering the Patient was ſo very lean, we judged it more for our Purpoſe to begin at the lower Part, near the great Tendon, and ſo to run the Knife upward to the Strap; by which Means we propoſed to preſerve a greater Quantity of the Fleſh and Skin; which ſucceeded according to Wiſh.

'For the reſt, we accompliſhed the Amputation in the ſame Manner as has been directed by you; and it was no ſmall Satisfaction to us, to ſee that our Patient did not loſe above three Ounces of Blood during the whole Operation: And thus we were convinced of the ſingular Uſe of the Leathern Bandage, which being applied above the Knee, furniſhes us with an uncommon Advantage, of twiſting and faſtening the String upon it, which elſe muſt be held by a Servant; which could not have been done with any Conveniency in that cold Seaſon of the Year.

'Towards the Evening the Patient began to complain, that the twiſted String which cauſed a Compreſſion upon the Skin did much hurt him, which made us looſen it a little; but perceiving the Blood to run, becauſe the Arteries were not now detained under the ſame Conſtriction, we twiſted it ſtrait again; which done, the Bleeding ſtop'd again, and the Patient felt leſs Pain.

'We did not open the firſt Dreſſings till the Fourth Day after, *viz.* the 17th of *January*, when we took off all, excepting the *Veſſe de Loup* which ſurrounded the Fleſh that was brought over the mutilated Part, and finding it by this Time well cloſed up at the *Mignon*, we looſened the twiſtened String, and not one Drop of Blood followed.

'We put on the Bandage again as before, and ſo continued to do till the Nineteenth, when we took off the twiſted String, and for the reſt managed the Wound like a common Wound.

'What ſurprized us moſt of all at this Time was, that the Skin, which at firſt reached a great Way above the *Mignon*, contracted it ſelf to ſuch a Degree, that on the Tenth Day we found it ſhrunk together above four Fingers breadth; upon which Account we made this Obſervation, That in ſuch-like Occaſions as this, we ſhould always take as much of the Skin and Fleſh as poſſibly we can.

'After the Amputation was finiſhed, we laid open that Part which was cut off; where we found the Bones of the great Toe, and of the other Toes, as well as moſt of the Bones of the *Metatarſus*, quite rotten; and even thoſe that appeared at firſt Sight to be ſound, after we had cleared them of the *Perioſteum*, were found to be full of a fœtid Matter, which ſhews that we ought not to ſtay for an Exfoliation.

'This is the Third Perſon unto whom we have within a ſmall Time cut off their Legs upon the ſame Account, (*viz.* There being gathered, and iſſuing out of their corrupted Bones, a putrid Matter, which by the Circulation infected the whole Maſs of Blood;) all which muſt ſoon have died by a lingring Feaver, unleſs the Cauſe had been removed; for it is very obſervable, that they were all Three free from the Feaver within a few Days after the Operation.

'This is, Sir, what I thought my ſelf obliged to impart to you, as well to ſhew you my juſt Acknowledgment and Gratitude, as not to keep buried in Silence the ſingular Advantages that ariſe from your never ſufficiently to be praiſed new Invention. I conclude with this Aſſurance, that I am always,

SIR,

Yours, &c.

The

The Author's Answer to the preceding Letter.

SIR,

'I Give you my most humble Thanks for the Goodness you have been pleased to express towards me, in letting me know with what Success you have put in Practice my new Invention of Amputation of Legs. I had indeed heard of it before, notwithstanding which, your Ingenuity in imparting to me all the Particulars of this Operation, has put a great and singular Obligation upon me. What seems to me chiefly remarkable in this Case, is the deplorable Condition unto which the Patient was reduced, whom you have represented to me so much emaciated and reduced to such a low Condition by the Feaver and Suppuration, that I should scarce have had Resolution enough to attempt the Operation; tho' it is not very long since I made two Amputations after the ancient Method, and that upon two Persons that were much under the same Circumstances; one being a *French* Chirurgeon, a Refugee, and the other an Inhabitant of these Provinces; for I did not judge it prudent to make the first Trial upon two Subjects where every Thing was to be feared, and but little to be hoped.

'I flatter my self that you will not think amiss, if I take the Liberty to give you my Opinion without Reserve, concerning certain Circumstances which you have related to me, together with what my own Experience shall suggest unto me upon this Head; desiring you at the same Time to use the same Freedom with me, as well in Respect to the Point in Hand, as to all others which have any Relation to our Profession; that so both our Experience and Observations may redound to the Advantage and Progress of our Art, and to the Benefit of our afflicted Neighbours.

'You tell me, That the Strap which I make use of to bind that Part where the Amputation is to be made, could not be straitned so much as you would have it, because it was to make two Circumvolutions about the Leg. I am apt to believe that your Strap was made of too thick a Leather, or else that you did not fasten the first Circumvolution as much as it ought to have been; for in case I do so, I find I can make mine as strait as I please: After which, 'tis an easy Matter for me to put the End of the Strap into the Buckle, and to fasten it there by the Help of the Pins or Tongues. 'Tis upon this Account that the Holes in the Strap must be very close to one another, and that the Pin be loose or apart, that so the Strap may not be in a Condition to give Way after it is once fastened by the Pin. Besides, that this Way is very easy for the opening of it; for you need only pull out the Pin, and the Strap falls off of it self: But, as you very well remember, this is of very little Consequence, because a common Roller may be made use of instead of this Strap.

'You tell me next, That you did begin your Incision near the great Tendon, and so run your Knife upward as far as to the Ligature which was made upon the thick Part of the Leg; and that in order to preserve more of the Flesh. This Observation of yours is founded upon good Reasons, and very remarkable in Respect to such Persons who have the Calves of their Legs much emaciated.

'I am likewise extreamly well pleased to understand, that your Patient did lose but very little Blood during the Operation; and I am almost sure, that even in the common Amputations, I have not lost much more Blood, since I have made use of my Leathern Engine, and the concave Plate. But at the same Time I can't but wonder, what made you keep on the twisted String so long and so strait; and that when you did loosen it a little the same Night after the Operation, to ease your Patient, the Blood should have begun to flow, because never any such Thing happened to me. I am apt to imagine, that the only Reason why it happened thus, must be, that the Bladder was not applied close and strait enough with the sticking Plaister; or else, that the Plate was not kept strait or close enough by the two great Straps.

'For immediately after the Operation is over, and that the Patient is laid in Bed, I altogether loosen the twisted String, and take

'take out the Stick; yet, by Way of Precaution, I leave on the String, in caſe there ſhould be occaſion to twiſt it again. If I find the Leathern Engine to be too ſtrait on the inferior Part of the Thigh, I looſen one or two Points of the ſmall Straps (even on the ſame Evening after the Operation) which faſten them to the exterior Part of the Thigh; and yet I don't remember that ever I ſaw ſo much as one Drop of Blood follow after this Looſening: It being requiſite the Circulation of the Blood, and of the other Humours, ſhould not be intercepted, for fear of an enſuing Gangrene, which may eaſily happen, in caſe the Parts are as it were ſtrangled by too hard and too long a Conſtriction.

'Upon this Account it is, that I endeavour to make as little a Compreſſion upon the Thigh and the Stump as is poſſible; but on the other Hand take care to keep the *Mignon* cloſe; this being the Place where there is the leaſt Fear and Danger of any ill Accidents, even tho' it ſhould happen to be too much ſtraitned or ſqueezed by the Concave Plate. However, about Ten or Twelve Hours after the Operation is over, I commonly looſen the great Straps which keep the ſaid Plate cloſe to it by a Point or two.

'As for my firſt Dreſſings, I never leave it on above two Days, and then I open and take off the twiſted String, the Leathern Engine, and the concave Plate; and after that, never put them on again.

'I likewiſe take off as much of the Dreſſings as I can, (but to be ſure without the leaſt Violence) by moiſtening thoſe Parts that are very dry, with a Spunge dip'd in warm Water, and after that dreſs the Wound once or twice a Day.

'I don't apply my *Supporter* or *Retainer* before all the Dreſſings are removed, as well from the Stump as the Fleſh that covers it; and after this, when the Wound is well cleanſed, I apply it, in order to make it to unite the better with the Bone, and to dreſs the Wound with the more Eaſe.

'It is certainly highly worth taking notice of, that the Fleſh which is brought over the mutilated Part ſhould unite it ſelf ſo ſoon and ſo cloſe to the Stump, eſpecially to the Bone; and that the ſuperfluous Part ſhould contract and cloſe up to ſuch a Degree, as that there is not the leaſt Occaſion afterwards of cutting off the leaſt Part of it; and that it makes as it were a natural Bolſter under the *Mignon*, which ſerves it inſtead of a Supporter. And 'tis upon this Score that, as you have very judiciouſly obſerved, we ought always to take Care to preſerve as much of the Fleſh and of the Skin as poſſibly we can.

'Sir, I conclude, with giving you once more my hearty Thanks for the Favour you have been pleaſed to do me, in imparting to me every Thing that happened to you upon this Occaſion, I ſhall always be ready to acknowledge this Obligation, and deſire you to let me know, whether your Patient is exempted from thoſe Sympathetick Pains wherewith I told you ſome others were afflicted, and whether he begins to reſt upon his *Mignon*. If you will do me the Favour as to preſent my Reſpects to the Burgomaſter *Zypeſteyn*, and the two Profeſſors *Vallan* and *Munninus*, and the reſt of my Acquaintance, it will be an additional Obligation to,

SIR,

Yours, &c.

Of AMPUTATIONS. *Taken out of Monſieur* Dionis's *Courſe of* Chirurgical Operations, *Demonſtration* IX.

THE Intent of all the other Chirurgical Operations (excepting in this) is to preſerve that Part upon which they are to be made. Thus for Inſtance, in the Eye, the Operation is intended for no other End, than to correct or amend its Defects, and to reſtore it to its natural Functions: But in this the Aim of the Chirurgeon is to deſtroy and cut off the whole affected Part, not only as uſeleſs, but alſo as pernicious, becauſe it is apt to communicate its corruptive and malignant Quality to the whole Body: So that in the Operation of Amputation, we do not propoſe to our ſelves the Preſervation of the Part upon which this Operation is performed, but rather that of the whole Body, which would inevitably be loſt without its Aſſiſtance; it being better to extirpate or take off a Limb, than to die with all ones Limbs entire.

When once a Leg or Arm is gone into an abſolute Mortification, ſo that the innate Heat is entirely extinguiſh'd in the Part, there is an unavoidable Neceſſity of removing it by Amputation, this being the only Way to preſerve the Patient's Life, Delay being dangerous, and ſerving only to encreaſe the Danger, and the Evil it ſelf.

However, it ought to be well obſerved, That there are Two Degrees in what we call a Mortification: The Firſt is call'd a *Gangrene, viz.* when the Part begins to go into a Corruption or Mortification; and the Second, a *Sphacelus*, when it is gone into a total Corruption, or abſolute Mortification.

In a *Gangrene* you may ſometimes hope for a Cure, by the Uſe of ſuch Remedies as I ſhall preſcribe anon; but in a *Sphacelus* there is no other Remedy but the Extirpation or Amputation.

A *Gangrene* and a *Sphacelus* being Two Diſeaſes which differ only in Degrees, owe their Riſe to one and the ſame Cauſe, *viz.* to the Circular Motion of the Blood being interrupted. As long as this Motion is continued, and that thereby the nutritious and ſanguinuous Juices are conveyed into the Part, it retains its natural Heat, Strength, and Life; but ſo ſoon as this Diſtribution does ceaſe, or is interrupted by ſome Cauſe or other, this Heat, Motion, and Life, ceaſes alſo; ſo that as it is owing to the Preſence of the Blood and vital Spirits that Life is preſerved in the Part, ſo when it is abſent, it muſt of Neceſſity go into a Mortification and Deſtruction.

This Diſtribution of the Blood, which is the only Support of our Machine, and which is abſolutely neceſſary to give Life to the ſeveral Parts, may be interrupted by an almoſt infinite Number of Diſeaſes.

Large Tumours, Eriſipela's, great Inflammations, exceſſive Colds, very ſtrait Compreſſions, a ſudden Defluxion of a Seroſity of a malignant Nature, Bitings of venemous Creatures; all theſe, I ſay, may prevent the Influx of the Blood into the Part, and that which is there before from being carried back to its Source, in order to its being ſupplied with new Heat in its reiterated Paſſages through the Ventricles of the Heart; ſo that all Communication being cut off betwixt the Part and the Principal of Life, it is ſeized with a *Gangrene*, and in a few Days more with an abſolute *Sphacelus*.

I will not pretend at this Time to enter upon a particular Account, in what Manner theſe ſeveral Diſeaſes produce a Gangrene. Many of our beſt Phyſicians have not been wanting to give us ſome new Syſtems of this Kind, which they ſay are very eaſie to be underſtood: And I could wiſh with all my Heart, that the Chirurgeons did not meet with more Difficulty and Obſtacles in the Cure of a Gangrene, than the Phyſicians do in their Diſcourſes. But I will, in lieu thereof, add ſomething in relation to Two other Cauſes which require this Amputation, *viz.* violent Contuſions, and large Wounds, becauſe, as I told you juſt now, in theſe Two Caſes alſo, a Chirurgeon ſees himſelf oftentimes neceſſitated to proceed to an Amputation.

A Contuſion is a Solution of Continuity of the carneous Parts, without the Skin being impaired. It owes its Cauſe either to a violent Fall or Blow, which producing a Dilaceration of the carneous Fibres and capillary Veſſels, theſe caſt out the Blood into the Interſtices of the Fleſhy Parts; and if this Violence happens to light where there is ſome conſiderable Vein under the Skin, which is torn aſunder or broken, there enſues a Congealing of the Blood, which as it were overflowing the Part, produces a large Tumour, with an exceſſive Tenſion, which Swelling of the Part preventing the Influx of the Vital Spirits, this may occaſion a Gangrene.

To prevent the ill Conſequences that may ariſe from ſuch a violent Contuſion, adminiſter and reiterate Phlebotomy; let the Patient take immediately a Glaſs full of vulnerary Water, in which you may diſſolve a Spoonfull of the Balſam of *Fioravanties*; or elſe give him Two Drams of the Confection of *Hyacinth*, or *Alkermes*, diſſolved in Two Ounces of *Aquavitæ*; to be taken at one Draught. You may alſo boil the Aromatick Herbs, ſuch as *Sage*, *Roſemary*, *Hyſſop*, *Fennel*, *Majoram*, *&c.* in Wine, wherein you muſt ſteep your Compreſſes, and ſo apply them warm to the affected Part, and often renew them.

If you find the extravaſated Blood not to diſſolve and diſperſe by Tranſpiration by the Help of theſe Remedies, but that the Part remains tenſe, lumpiſh, and heavy, and that you perceive its Colour to be changed, you muſt make ſome ſlight Scarrifications with the Lancet, *A.* and let the Blood out, and diſcharge it ſelf that Way; and in order to promote the Efflux of the Blood, you may waſh or bathe the Part where the Scarrifications are made with Warm Sea-Water, and apply to them a Cataplaſm of the reſolvent Flowers of *Farinæ Reſolutivæ*, boil'd in *Hydromel*; adding to it ſome Turpentine, the Powder of Roſes, *Aquavitæ*, and a little *Theriaca*.

The next Day, in caſe you find the Part ſtill very much ſwell'd, and that there are no great Signs of much Life, you muſt make Inciſions with the Inſtrument, *B.* which muſt be larger and deeper than the Scarrifications you made the Day before; and if, after they are made, the Patient feels ſom Pain, and that the Blood follows, 'tis a Sig that there are ſtill ſome Remnants of Life i the Part, which you muſt endeavour to ſup port and revive by an Ablution with *Spir tus Vini Camphoratus*, in which has been di ſolved ſome *Unguent. Ægyptiacum*, and ove that apply the above-mentioned Cataplaſm

If towards Evening, inſtead of perceivin the Tumour to abate, you find an œd matous Swelling, accompanied with a *Phly tenes*, and with very little Pain, you mu with the *Scalpel*, *C.* make deep Inciſions, as to make the Patient cry out, and wa them with Spirit of Wine, or with the Y low-Water, made of *Lime-Water* and *Sublim* and at the ſame Time make him frequent take cordial and ſudorifick Medicines Wine, this being the moſt cordial Vehic of all.

But in caſe, when you are entring t Room, a certain ſweetiſh Scent ſtrikes in your Noſe, and that when you are dreſſi the Patient you perceive a cadaverous Sme and that the Party appears livid, and without Senſation, you may look upon th as Signs of a confirmed Mortification; a as ſuch there being not any Hopes of ſavi the Leg or the Arm, muſt, the ſooner better, advertiſe the Patient's Friends of Danger, and that there is no other Way to ſave his Life but by *Amputation*.

In the Royal Hoſpitals of the Army, eit during the Siege, or after a Battle, we m with frequent Occaſions of having Recou to this Operation; for the Cannon-Ball, the Bullets of the Fire-Arms, as wel the Bombs and Granadoes, make ſuch m rabled Havock among the Arms and Leg the Soldiers, by bruiſing and tearing t into a Thouſand Pieces, that it is a g Rarity to ſee any of them ſaved, notw ſtanding all the Skill of the Phyſicians Chirurgeons, and their Conſultatio Without which, I do not remember ever cut off a Limb in the Army comm ded by the Duke of *Burgundy*.

In caſe a Leg or an Arm is taken off Cannon-Ball, there is no Occaſion for tring upon a Conſultation concerning Operation, becauſe it is already don your Hands; yet even in this Caſe the Two Things that fall under the Ch

g

geon's Conſideration and manual Operation.

The *Firſt* Thing is, to ſaw off the Stump of the Bone, which very ſeldom happens to be broken ſo exactly, but that there are ſome ſharp Prominencies left, which muſt be taken off, leſt they ſhould prick and penetrate through the Fleſh.

The *Second* is, to prevent or to ſtop the Flux of Blood, by making convenient Ligatures upon the Veſſels, or by applying the Vitriol-Buttons, or ſuch other Stipticks as ſhall be treated of hereafter: For though moſt commonly the Effuſion of Blood is ſtopp'd by the Fire that is contained in the Bullet, yet when the Eſcar falls off ſome Days after, there will enſue a great Flux of Blood, which may throw the Patient into Danger of his Life, unleſs the Chirurgeon takes timely Care of it.

In caſe the Part is not entirely divided, but hangs on ſome Pieces of Fleſh, you muſt cut it off with the Help of a Knife or Sciſſers, and dreſs the Patient in the ſame Manner as if you ſtood in Fear of an *Hemorrhagie*.

If a Bone of the Arm or Leg be fractur'd into many Pieces, with looſe Pieces, juſt as we ſee a Nut crack'd, there is an abſolute Neceſſity for an Amputation; or elſe in caſe a Bullet penetrates into the Hand or Foot, and bruiſes or fractures the ſmall Bones very much, it will likewiſe prove a difficult Task to ſave the Parts.

Of this, I ſaw an Inſtance in an Officer of the *Gendarmerie*, who being wounded with a Musket-Ball in the Battle of *Spires*, the Chirurgeons did all they could to ſave his Leg, but were ſome Days after forced to cut off his Leg, and ſoon after his Thigh likewiſe, notwithſtanding which he died, both theſe Parts being ſeized with a Gangrene in a very ſhort Time.

There is another Diſtemper yet behind, which ſometimes conſtrains us to come to an Amputation, *viz.* a *Caries* or Rottenneſs of the Bone, which, in Spite of all the Remedies, will hollow it out as if it were Worm-eaten.

I remember, That about Ten Years ago, I was forced to make an Amputation of a Leg to one of the young Men belonging to the Caſtle of *Verſailles*, by reaſon of an old *Caries*, which could not be cured by any other Remedies, and which made the whole Bone appear as if it were Worm-eaten. But after the Operation he did well, and continues ſo to this Day.

Sometimes a Defluxion of an acrious and corroſive Seroſity, of the Nature of an *Aquafortis*, will fall upon and ſettle betwixt the Bones of the *Carpus* and of the *Tarſus*, and ſeldom leaves them till they drop out Piecemeal.

Sometimes a malignant ſcrophulous Humour being mix'd with this Seroſity, theſe Two, by their joint and mutual Action upon the Bones, produce ſuch a Confuſion there, that there are not wanting Inſtances of the Chirurgeon's having been forced to come to an Amputation, after they were judged to be compleatly cured for ſeveral Years before.

But whenever a Chirurgeon finds himſelf reduced to an abſolute Neceſſity of having Recourſe to this laſt Remedy of Amputation, (let the Cauſe be what it will) I would adviſe him not to undertake it without a previous Conſultation with ſome of his Brother-Chirurgeons; without which, he will not only alone be anſwerable for the Event, but alſo, even after the Operation ſucceeds according to Wiſh, expoſe himſelf for ever after to the Cenſure and Reproaches of the Patient, and his Friends, who regretting the Loſs of a Limb, will be apt to imagine, that he did undertake the Amputation too haſtily, and without an abſolute Neceſſity; all which may be avoided, if beforehand he enters into a Conſultation upon the Point in Hand, with ſuch Phyſicians and Chirurgeons as the Patient himſelf ſhall think fit to appoint.

But in caſe the Amputation is reſolved upon, the next Thing the Chirurgeon has to do, before he makes any other Steps towards it, is to conſider and agree on what Place this Operation is to be beſt performed. It has hitherto been received as a general Rule, That when an Amputation is to be made in the Thigh, it muſt be done as near to the Knee as poſſibly may be: That if it be a Leg, to make the Amputation above the Calf, though the Hurt lies only in the Foot, becauſe it is judged very improper to leave a long Stump behind, which may

prove troubleſome and incommodious to the Patient for the Remainder of his Days: As on the other Hand, when this Operation is to be performed in the Arm, it is to be done as low as may be, ſo as to leave a long Stump behind, which not only may prove ſerviceable to the Patient, but alſo take off ſomewhat of the Deformity. Theſe are the Methods or Rules of the Practice of Chirurgery, which have not been call'd in Queſtion till of late Years.

They all agree in the Manner of Amputation of a Thigh or Arm; but diſagree very much about that of the Leg.

Among thoſe that exclaim againſt the Practice of the *French* Chirurgeons, who make this Amputation near the Knee, tho' perhaps all the reſt is ſound except the Foot, is Mr. *Solingen*, a famous Practiſer in *Holland*; aſſerting, That the Chirurgeon ought to ſave the whole Leg, and cut off only the Foot above the Ankle; and after that, adapt to the Stump an artificial Foot of his Invention, which he ſhews us how to faſten to the Sides of the Leg by the Help of Two ſmall, thin, and well-poliſh'd Springs of Steel and Screws. He aſſures us, that this artificial Foot being well adapted to the Part, the Patient may walk upon this artificial Foot very near as well as if it were a natural One.

I muſt confeſs, I am of the ſame Opinion with this Gentleman, and thoſe that follow his Footſteps; it being my Opinion and Advice, always to make the Amputation of a Leg as low as poſſibly may be, provided you may preſerve the Motion of the Knee; for in caſe it ſhould be ſo as to be in Danger of remaining always bent in the ſame Poſture, it would be better to cut it juſt below the Knee, and to leave only a Stump, of ſuch a Length as is ſufficient for the Support of the wooden Leg. But in caſe you can preſerve the Motion of the Knee, in making your Amputation ſo as to ſtand in need only of an artificial Foot, you by ſo doing avoid the Deformity which ariſes from the wooden Leg, and the Patient may walk afterwards with much more Strength, Security, and Conveniency.

Some Authors there are, who ſtand up for the Amputation of a Leg in the Joint of the Knee, and alledge in their Behalf, that the Operation is ſooner performed, becauſe there is not near ſo much Time required here, as there is in the Sawing off of the Bone.

But this Method is not much approved of by our modern Practiſers in Chirurgery, as being ſubject to no ſmall Inconveniencies: For, ſay they, when the Part is much tumefied, it is no eaſie Matter to find out the exact Place of the Articulation; they are obliged to leave the Knee-pan in its Place, which proves not a little troubleſome afterwards. The Two Heads of the *Femur* being laid bare, they muſt of Neceſſity exfoliate, and are not cured for a long Time after, becauſe there is no Fleſh upon the Knee to cover them. And laſtly, they add, that a wooden Leg cannot be fix'd to the Part without much Difficulty and Inconveniency to the Patient.

Fabricius is of Opinion, That the Amputation of a Leg is not to be made in the ſound Part, but Two Inches lower; for he would have us perform this Operation Two Fingers Breadth below that Place where the Gangrene ends, *i. e.* in the very mortified Part; and that afterwards you ſhall apply ſeveral actual red-hot Cauteries, to correct the remaining Part of the Mortification, which will fall off in the Nature of an *Eſcar*; and by ſo doing, ſays he, we prevent the Pain and Flux of Blood.

But it is obſervable, That when this dead and burnt Fleſh comes to fall off, it leaves the Stumps of the Bones quite bare, which muſt be ſawed off a Second Time: And conſidering that no Chirurgeon is able to warrant, that the Gangrene will ſpread it ſelf no further, (becauſe ſome Part of it is left behind) I much queſtion whether any of our Chirurgeons would have ſo much Aſſurance in his own Judgment, as to adviſe any Body to put this Method into Practice.

Neither is it ſufficient alone to pitch upon the exact Place where the Amputation is to be made, before you proceed to the Operation, but you ought likewiſe to agree and reſolve upon a certain Method how to ſtop the exceſſive Flux of Blood: For the Cutting off of a Leg is the leaſt Part in this Operation; perhaps a Butcher might do very near the ſame Thing; but the main Point is, how

how to ſtop the exceſſive Flux of Blood with Dexterity and Security. And here it is, that the Chirurgeon has a very fair Opportunity of ſhewing his Ability, both in making Choice of the beſt Manner and Method, and next, in putting it in Practice with the utmoſt Dexterity.

The Art of Chirurgery furniſhes us with Three different Ways or Methods of Stopping the Flux of the Blood; *Firſt*, the Fire; *Secondly*, the Vitriolate Button; and *Thirdly*, the Ligature.

The Uſe of *Fire* in ſuch-like Caſes was ſo univerſal among the Ancients, that they ſcarce performed any Operation without it; as we ſee now-a-days our Farriers apply it in all their Operations to the Horſes.

They made their actual Cauteries red-hot; ſome of which were faſhion'd in the Shape of a Button, others like an Olive, and others flat. Theſe they applied red-hot to the Orifices of the Veſſels immediately after the Amputation was made, and by this Means burnt both the Veſſels and the adjacent Fleſh; which producing an Eſcar, this prevented the Efflux of the Blood. But after all, this cruel Operation did not prove a ſufficient Security againſt the Effuſion of the Blood; for ſo ſoon as the *Eſcar* came to fall off, it would break out again with the ſame Violence as before, after the Operation was made; and this was the Reaſon why in the ſucceeding Ages the Chirurgeons ſaw themſelves obliged to have Recourſe to more mild Applications than the Fire.

To anſwer this End, the *Vitriolate Button* was pitch'd upon as the moſt proper Remedy, being nothing elſe but Vitriol beaten into ſmall Pieces, and wrapp'd up in Cotton. Of theſe they make up Three or Four, and apply them to the Orifices of the Veſſels that are cut aſunder: The Vitriol being diſſolved by the Moiſtneſs of the Blood, burns and cauteriſes as far as it reaches, and producing an Eſcar, ſtops the Efflux of the Blood. This is the Practice made Uſe of in all the Amputations that are made in the *Hotel-Dieu* at *Paris*. But this *Eſcar* is ſubject to the ſame Inconveniencies with that made by the Fire; for when it falls off, the Blood will ruſh out again: For which Reaſon it is, that they always take Care to keep the Eſcar from falling off as long as poſſibly they can; and ſuch as make Uſe of this Remedy, muſt always be provided with ſome freſh Vitriolate Buttons, as often as they dreſs the Patient, in order to apply them whenever they find the Blood ready to ſtart out again.

Theſe Two before-mentioned Methods of Stopping the Eruption of the Blood after Amputation, being, as you ſee, inſufficient, our modern Chirurgeons have invented certain Ligatures of the Veſſels, which they have found much more effectual by reiterated Experience; ſo that now, by the Help of a Needle and Thread, they are able to ſtop the Blood with much more Security than the Chirurgeons in former Days could do with their Fire and Vitriol: Beſides that, theſe Two laſt could not produce an *Eſcar* without cauſing exceſſive Pains to the Patient, which is avoided by this laſt Operation.

This Ligature is made Two different Ways: In the *Firſt*, you muſt pinch the Extremity of the Artery with an Inſtrument call'd the *Raven's-Beak*, or with a Pair of Pincers, with a Ring call'd the *Valet Apatin*, and then conveying a wax'd Thread along the Inſtrument, you tie up the Artery with a double Knot; and to prevent the Thread from being thruſt off at the Extremity by the Pulſation of the Artery, one End of this Thread ought to be drawn through a Needle, that ſo you may draw it through the Body of the Veſſel; which done, you muſt ſecure the Ligature by the Help of ſome Knots.

The *Second* Sort of Ligature is made thus: Take Two ſtreight Needles, threaded with one Thread, well wax'd: One of theſe you muſt convey above and on the Side of the Artery, and the other likewiſe on the Side and below it, and then bring them out about Two Fingers Breadth above the Place where the Inciſion was made, and at half a Finger's Breadth Diſtance from each other. You muſt faſten the Two Ends of the Thread upon a little Compreſs, one near unto the other; ſo that the Veſſels being quite cloſed up by the Thread, there is no further Danger of any Eruption of the Blood. In this Operation you muſt take eſpecial Care not to entangle the Extremities of the Nerves that are cut aſunder in the Thread;

for being thus ſtreighten'd, they would go into convulſive Motions, and ſpring or ſtart backwards, to the great Danger and Trouble of the Patient.

I do not in the leaſt queſtion, but that, conſidering the Deſcription I have given you of theſe Three different Methods of preventing the exceſſive Efflux of the Blood after Amputation, you will give your Vote in Favour of the Third and Laſt, as being the leaſt painful, and yet the moſt ſecure of all. And this is the ſame alſo I ſhall propoſe to you in the Amputation I am going to ſhew you; conſidering in this, as well as in all the other Operations, what it is that is to be done *before*, *during*, and *after* the Operation.

Before the Operation, you muſt provide all your Furniture, *i. e.* every Thing that is required and neceſſary for its Accompliſhment: All this muſt be ready at Hand in a Baſon, that nothing may be wanting when you ſtand in need of it, but be ready to be taken as you have Occaſion for any of them.

For in this Operation you muſt make conſiderable Proviſions of *Pledgits*, *Adſtringents*, and *Compreſſes*; and as it requires ſome Time to get all theſe Things in Readineſs, you muſt not prepare them in Sight of the Patient, leſt he ſhould be ſtartled at the Sight of all the Inſtruments, Lints, Compreſſes, Bandages, *&c.*

This Furniture conſiſts of Three different Things:

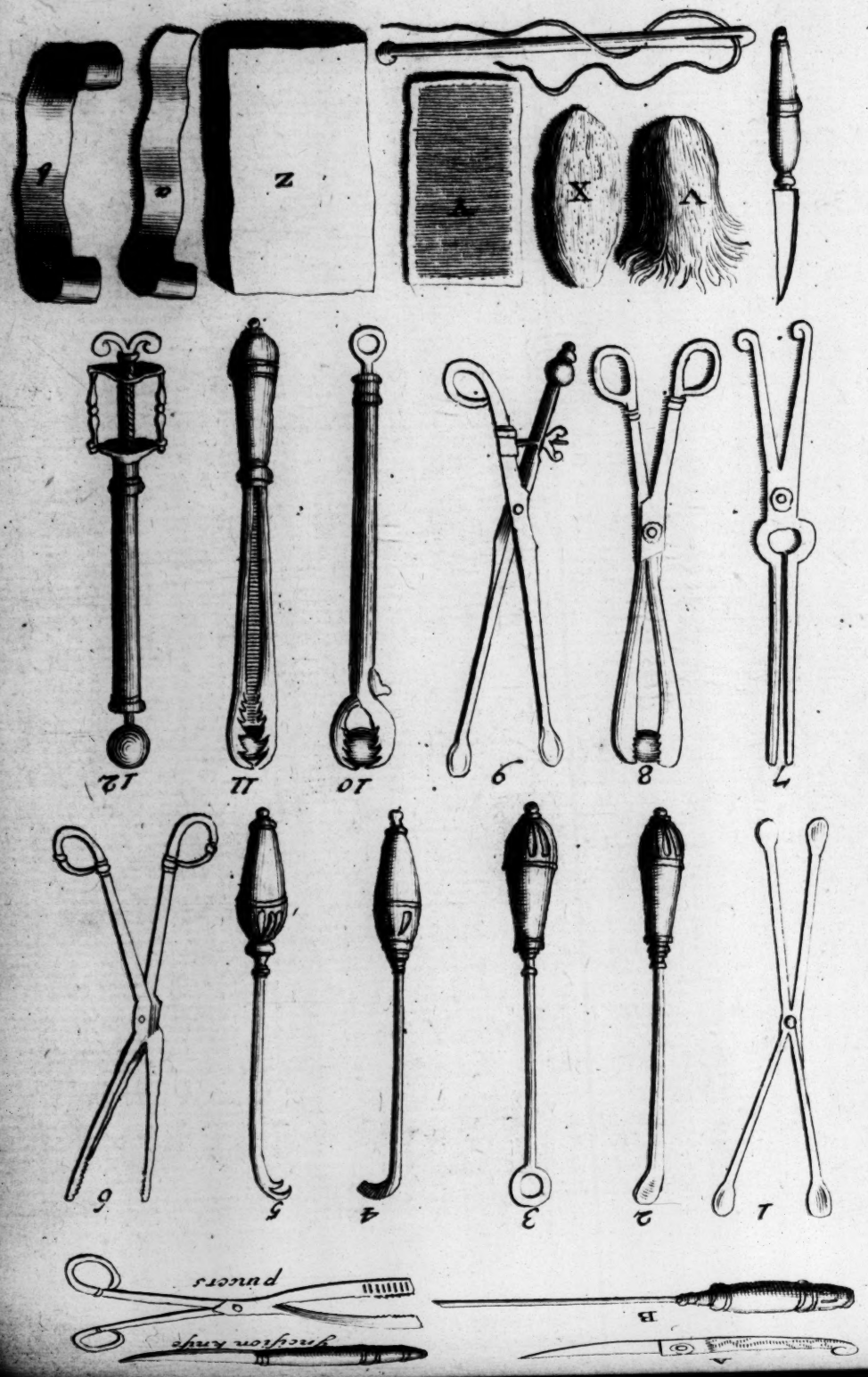
Firſt, of the Inſtruments neceſſary for performing the Operation of Amputation. *Secondly*, of what is neceſſary for the Stopping of the Efflux of the Blood after it is made. And *Thirdly*, of what is requiſite for the Dreſſing of the Patient.

As for the *Firſt*, you muſt be provided with Two Compreſſes, to be put under the Ligatures, *viz.* one round, and another of an oblong Figure; a double *Tourniquet*, to keep it the ſtreighter; a ſtrong Linen Ligature, to be put about a Finger's Breadth above the Place where the Inciſion is to be made; a large crooked Knife, which muſt be ſharp-edged at one Side only, but with a broad Back, that the Chirurgeon may reſt his Left Hand upon it, for the quicker Diſpatch of the Inciſion; a large *Scalpel*, to cut aſunder the Fleſh that lies betwixt the Two Bones and the *Perioſteum*, in caſe it be not divided already by the crooked Knife; a very good, fine, and ſharp-tooth'd Saw, well greaſed, to perform its Function with the more Diſpatch.

As to the *Second*, *viz.* to ſtop the Eruption of the Blood, you muſt be provided with a Pair of Pincers, ſhaped in the Figure of a *Raven's-Beak*, and upon this a Thread wax'd or dipp'd in *Lac de Loup*; another Pair of Pincers, with a Ring, to cloſe up the Veſſel or Artery at its Extremity: Needles, wax'd Thread, ſmall Compreſſes, Adſtringents made up of *Bole-Armenac*, *Terra Sigillata*, *Sangu. Drac. &c.* well powder'd, and incorporated with Whites of Eggs, to be ſmear'd upon the Pledgits, and Three or Four Buttons of *Vitriol*, in caſe you ſhould have Occaſion for them.

In the Third Place, *viz.* to dreſs the Patient, you muſt make Proviſion of Three ſmall Four-ſquare Compreſſes, to apply them to the Extremities of the Veſſels; Two Pledgits well ſoak'd in Spirit of Wine, to be applied to the Stump of the Bone after Amputation; a good Quantity of Pledgits covered with Adſtringents, wherewith to cover the whole Wound; a Stoupe of ſuch a Bigneſs as to encloſe the whole Extremity of the Stump of the Bone; a Bladder, at the Bottom of which you muſt put adſtringent Powders, and which muſt be cut open at the Top, to give Entrance into it to the Stump of the Bone; a large Emplaſter and Compreſs, ſlit in the Shape of a *Maltheſe* Croſs; Two oblong Compreſſes, of about half an Ell in Length, and Two Inches in Breadth; a Band roll'd up with its Chief; another of about Four or Five Ells long, and Four Inches broad, and roll'd with Two Chiefs, in order to make that Bandage which is call'd the *Capeline*; and a good many Napkins for divers Uſes.

The Patient muſt be placed upon a Board, or the Edge of the Bed, whilſt one of the Attendants, kneeling upon the Bed, holds him up backwards againſt his Breaſt; and another of the Attendants, ſitting on one Side of the Patient, which muſt be the ſame Side where the Operation is to be performed. This Attendant muſt with both his Hands graſp the lower Part of the Thigh, and draw the Skin upwards as much a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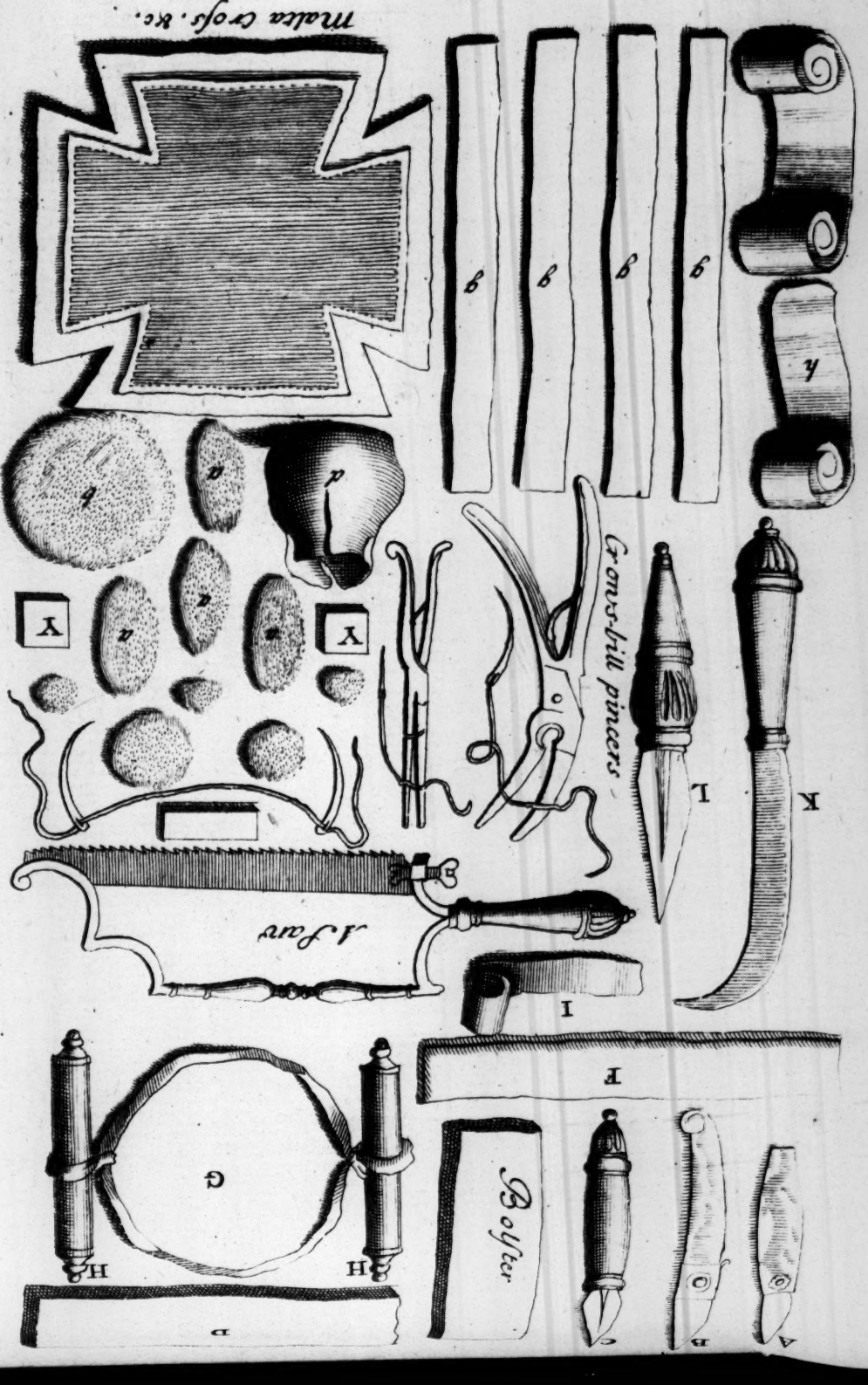
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as possibly he can, whilst the Chirurgeon, who is to perform the Operation, is applying the Ligatures. The Leg is to be wrapp'd up in a Napkin, *D.* almost to the Place where the Incision is to be made, which must be held steady by a Third Servant, placed directly opposite to the Patient, with one Knee on the Ground, to keep up the Leg to a convenient Height. A Fourth Attendant must be charged with taking Care of the Instruments, and stand near the Operator; and a Fifth, with every Thing that is necessary for the Dressing of the Patient: And after all, you will stand in Need of a Sixth Attendant, to be ready upon all Occasions to do what shall be ordered him by the Person that makes the Amputation; so that you see there is an absolute Necessity to have a good Number of Attendants at hand on such-like Occasions.

The Chirurgeon who is to perform the Operation, must endeavour to encourage his Patient as much as he can, and order him about half a Glass of Wine, to make him go through the Pain the better. After this, he must place himself betwixt his Two Legs, because there being a Necessity of sawing both the Bones asunder at the same Time, this Position is the most convenient, in respect of both Legs, *viz.* whether the Right or the Left that is to be cut off: For if he were placed on the Outside, he would be obliged to saw first the *Tibia*, and after that the *Perone*, which being very weak, would be apt to break before the Operation could be accomplished; besides that, by sawing these Two Bones one after another, the Operation is retarded, and consequently the Patient will suffer more Pain.

Every Thing being thus disposed, let us now see in what Manner we ought to proceed in the Operation it self.

You must make the Beginning by a Compress of about half a Foot long, streight and thick. This must be placed under the Bent of the Knee, so as that it may reach to the Place where the Second Ligature is to be made. Another Compress of a round Figure, *F.* must be put about Three Fingers breadth above the Knee, so as to reach over the upper Part of the oblong Compress, to procure a sufficient Compression of the Vessels. Over this last Compress you must make the Ligature, *G.* which must serve for a Turning; and under this Ligature you must place Two small Sticks, *H, H, viz.* one on the Outside, and the other on the Inside of the Thigh, and then twist or turn them about till you perceive the Thigh to be sufficiently streighten'd, when you give the Two Sticks to the same Servant, who with his Hands incloſing the Thigh, draws the Skin upwards.

Then you take a Second Ligature, *I.* which must be made Three Fingers Breadth below the Knee, in order to keep tight the Skin and Muscles during the Incision. You must take Care, That after you have made Two or Three Circumvolutions with this Ligature, and fasten'd it with a Knot, to fasten them at the inferior Part of the longitudinal Compress; for if you should leave them hanging down, they might prove troublesome whilst you are making the Incision.

This done, take immediately with your Right Hand the crooked Knife, *K.* which you must fix upon the very Ridge of the *Tibia*, and lean upon the Back of it with your Left, and so descending underneath the Leg, you may reascend on the Inside of it, till you come to the same Place where you did begin before, and by a circular Incision, have cut through the Flesh to the very Bones. Then you lay aside this Knife, and with the *Scalpel*, *L.* cut asunder the Flesh betwixt the Two Bones, and by bringing the *Scalpel* about the *Tibia*, cut asunder also the *Periosteum*, in case it were not divided well before; for if you should leave the *Periosteum*, and the Flesh that lies in the Interstice of these Bones, to be torn asunder by the Teeth of the Saw, this would serve only to encrease the Pain to the poor Patient, who is sufficiently tormented before.

Some Practisers in Chirurgery take a Piece of Linen, which they split or cut asunder at one of the Chiefs, so as to make Three of it, and that the Two Ends that are split should be brought betwixt the Lips of the Wound, so as to let the Third hang down; and that whilst the Chirurgeon is employing his Saw, a Servant should draw the Three Ends upwards. They pretend to reap a double Advantage by this Method; one, by keeping back the Flesh, the Bones may be

be ſawed higher, and conſequently the Stumps of theſe Bones will not ſtart out beyond the Fleſh after the Operation: The Second, that by the Application of this Linen Cloth they hinder the Saw from touching the Fleſh, and conſequently from proving ſo painful to the Patient as otherwiſe it does; and this, ſay they, the more, becauſe the Operation is not retarded as much as for one Minute, by the Application of this Linen Cloth.

You muſt endeavour to ſaw or divide aſunder the Bone ſo ſoon as you have applied it to it, with your Left Hand reſting upon the Leg. You muſt begin gently, till you find it a little Way enter'd the Bone; but when it is once well enter'd, you may then go on faſter, and ſtill faſter whenever you perceive it to have well penetrated into the Subſtance or Body of the Bone. He that holds or keeps the Leg ſteady, muſt now take Care not to liſt or raiſe it up higher, which would hinder the Operation of the Saw, or at leaſt its going on with Eaſe; and therefore Inſtructions ought to be given him, to let it remain in the ſame Station, the better to facilitate the Operation, and make the Saw run or go to and fro with Eaſe.

The Leg being cut aſunder, you muſt immediately take off the Ligature that is below the Knee, and take Hold of the Pincers with the *Raven's-Beak*, which is provided with a Ring, the better to cloſe the Veſſel after you have taken Hold of it.

Upon each of theſe Pincers muſt be placed a twiſted Thread, in order to tie up the Veſſels; and at the End of each of theſe Threads a Needle.

You muſt then order the Attendant to untwiſt the *Tourniquet* a little, in order to diſcover the Place where the Veſſel lies, by the ruſhing out of the Blood; and therefore you muſt take Care not to place your ſelf directly oppoſite to the Stump, but on one Side, unleſs you will have the Blood flie in your Face; and after you have made Uſe of the Pincers, you give the Inſtrument to a Servant, and make the Ligature, as has been ſhewn before; and in caſe you cannot take Hold of the Veſſel, you muſt then with the Two Needles, threaded with one Thread, paſs along the Sides of it, and then come out below the Bent of the Knee, where you may ſecure it, by faſtening both the Ends of the Thread upon the Compreſs, as I told you before.

There is a Third Method ſtill of ſecuring the Blood-Veſſel, *viz.* You muſt take a large crooked Needle, with a Thread in it, and let it ſtretch along on one Side of the Veſſel, and bring it out again on the other Side, ſo as to take Hold of a little of the Fleſh along with it; after which, you faſten both the Ends of the Thread to a Compreſs, and by this Means you ſtop the Efflux of Blood in a ſhort Time. I have ſeen it frequently thus practiſed in the Field-Hoſpitals.

The Ligature being made as it ought to be, the Chirurgeon muſt order the *Tourniquet* to be looſen'd; and if you find no more Blood a coming, you may reſt contented, for your Operation is made as it ought to be; but if by Miſchance the Ligature fails you, you muſt have Recourſe to the Three Buttons of Vitriol.

I need not tell you, that you ſhould ſuffer a certain Quantity of the Blood to diſcharge it ſelf from the Part, becauſe in this Operation the Patient will be ſure to loſe more Blood than is neceſſary for this Inanition, do you what you can to ſtop it, for every Drop of Blood that was in the Leg is loſt, and what was contained in the Vein of the Thigh is alſo very near all loſt, both during the Amputation, and after it is finiſhed, it being impoſſible to prevent it; ſo that the Quantity thus evacuated is oversufficient to diſcharge the Part; and there is not the leaſt Occaſion for any further voluntary Inanition of the Arterial Blood, which, inſtead of proving an Eaſe to the Patient, would ſerve only to weaken and exhauſt his Strength: So that the beſt Way is ſo ſoon as poſſibly you can to ſtop the Flux of the Blood by the Ligature, this being the only Means to preſerve the Strength of the Patient.

The Operation being over, you muſt dreſs the Patient, which you muſt do, the ſooner the better, with the utmoſt Care, after the following Manner:

You muſt order your Attendant to keep the *Tourniquet* all along ſtreight, as long as you are buſie in dreſſing the Patient; which

is done, leſt by the Impulſion of the Blood the Ligature ſhould be thruſt out of its Place; for it is obſervable, that the Ligature alone, unleſs ſupported by the other Apparel and Bandage, is not able to reſiſt the Force of this Impulſion; for which Reaſon it is, that you muſt begin your Dreſſing by the Application of Two ſmall Four-ſquare Compreſſes, *r*, *r*. which ſerve inſtead of Supporters to the Ligature, and are aſſiſtant in checking the Force of the Arterial Blood.

Unto the Two Stumps or Extremities of the Bones you muſt apply Two ſmall flat Pledgits, ſoak'd in Spirit of Wine, and all the fleſhy Parts muſt be covered with Pledgits, *a*, *a*, *a*, *a*. which muſt be pretty thick, and well covered with Adſtringents, and over theſe the Strap, *b*. that is to cover the whole Stump, which is to be put in a Bladder, *d*. cut open for that Purpoſe, in the Bottom whereof are the adſtringent Powders. Then you apply the Emplaſter, cut in Four Places, ſo that the middle Part be placed on the Stump, but the Four Corners or Chiefs incloſe the Knee. After this comes the large Compreſs of the ſame Figure, and then the Four longitudinal Compreſſes, *g*, *g*, *g*, *g*. ſo that the middle Parts of the Three Firſt be applied upon the Stump, in ſuch a Manner as to form the Figure of a Star; and the Fourth is to make ſome Circumvolutions about the Stump, ſo as to incloſe or embrace the Six Chiefs of the Three Firſt.

Before you apply your Bandage, you muſt take care to bend the Knee a little, and put it into ſuch a Figure as may be moſt proper to its being adapted to the wooden Leg: Then take the Band, *h*. with one Chief, and make Four or Five circular Circumvolutions with it about the Stump; after which, you aſcend with it above the Knee, and deſcend again upon the Stump; and thus you aſcend and deſcend alternatively as long as the Roller will give you Leave, and then you muſt faſten it at the End with a Pin.

Then take the Band roll'd up with Two *Chiefs*, and holding one of them in each Hand, you apply the middle Part to the Stump; and aſcending with both the *Chiefs*, you leave one there, and let your Servant hold it for the circular Circumvolutions, whilſt you with the other deſcend to the Stump, and aſcend again above the Knee, in order to faſten it there by another circular Circumvolution; and then you deſcend once more to the Stump; and thus you continue to do till the whole Band is taken up, and then you remove the *Tourniquet*. Unto this Bandage they have given the Name of *Capeline*, from *Caput*, *i. e.* a Head, becauſe it is one of the Bandages appropriated to the Head. But becauſe, after you have done with that Part of the Bandage which has made the Circumvolutions about the Stump, there will be ſtill remaining a conſiderable Part of the other above the Knee, you muſt apply a very thick Compreſs to the lower Part of the Thigh, and make ſome circular Cirumvolutions over it with this Part, which will be aſſiſtant in checking the impetuous Motion of the Blood towards the Ligature.

Your Bands being well faſten'd by the Help of ſeveral Needles, put the Patient to Bed, and lay under the Bent or hollow Part of his Knee Two Pillows, to keep the Stump upwards. The Stump muſt be ſupported for ſome Days after by a Servant with one Hand, and the Knee with the other, to prevent the Flux of Blood, and Relaxation of the Bandages, and to be upon a conſtant Guard, leſt the Blood ſhould penetrate thro' the Bandages unperceived by the Patient; unto whom you may give ſome Broth, adminiſter Phlebotomy Two or Three Hours after, and order him a regular Way of Living.

You muſt not remove the Firſt Dreſſing for the Firſt Two or Three Days; and even you muſt ſtay longer, in caſe you fear an enſuing Hemorrhagie upon the taking of it off; and when you do, you muſt gently take off the Pledgits, for fear the Thread of the Ligature ſhould be intangled in them. Then you may alſo remove the Bladder: Neither is there any further Occaſion for covering the Pledgits with Adſtringents; but in lieu thereof you may now apply a Digeſtive to further Suppuration.

If there be any Danger of a Gangrene, you muſt animate the Digeſtive with Spirituous Remedies, to revive the Wound, and keep out all Putrefaction; and you muſt

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continue your Dreſſing with cleanſing, incarnating, and drying Remedies. You muſt apply no Unguents to the Extremities of the Bones; but only Pledgits ſoak'd in Spirit of Wine, in Expectation of the Exfolation. When that is paſt, you muſt endeavour the cicatrizing of the Wound, a Thing not eaſy to be effected; for being of a rotund Figure, it muſt riſe from the Circumference to the very middle Joint.

It is generally obſerved, that moſt of thoſe Perſons that have an Arm or Leg taken off, complain of a Pain in that very Part which is removed by Amputation: You ſhall hear them ſometimes ſay, it is in the Great Toe; ſometimes in the Little, and that to ſuch a Degree, that they are not able to ſleep: Nay, I have heard ſome affirm it very poſitively, that theſe Pains exceeded, and were more inſupportable to them, than thoſe of the Wound it ſelf.

This Phenomenon owes its Origine to the conſtant Separation of a certain Quantity of Animal Spirits, which being diſperſed thro' the Nerves to ſerve for the Functions of the Body, and thoſe that are deſigned for the Motions and Senſations of the Part which is not extant there, (being ſeparated from the reſt) not meeting with any Part where to exert their Functions, muſt of Neceſſity flow back towards the Brain. It is owing to this unfortunate Reflux of the Animal Spirits, that the poor Patients are afflicted with theſe Senſations of Pain, with theſe irregular Motions, and involuntary Contractions, which oftentimes prove more fatiguing to the Patient than all the Pains occaſioned by the Wound it ſelf.

I know there are ſome Chirurgeons who don't admit of the Uſe of the Hog's Bladder, becauſe, ſay they, the Bladder retaining the Blood, when the Wound falls a Bleeding again, it may be ſome Time before it is perceived: But thoſe that are for the Uſe of the Bladder ſay, That this is the main End for which it is deſigned; for the Blood which comes from the Veſſels being retained, and intermix'd with the adſtringent Powders, will produce a Maſs or Paſt, which is apt to ſtop up the Orifices of the Veſſels, and conſequently to prevent any exceſſive Flux of Blood.

Some Chirurgeons adviſe, that after th Amputation is made, as you ſhould paſs Needle and Thread thro' the Skin of the ſu perior Part of the Stump, and with the ſam Needle and Thread do the ſame Thing in th inferior Part, and ſo tie both the Ends toge ther, that you ought to repeat the ſame Ope ration on the Right and Left Sides, ſo tha the Threads paſſing croſsways one over a nother, may draw the Skin together, an hinder the Fleſh from being too much lai bare. But this is approved of by a few on ly; for in caſe the Operation be made as i ought to be, the Skin, Fleſh, and Bone, ar cut alike, and this Operation with the Nee dles ſerves only to create freſh Pains to th poor Patient. Beſides that, in caſe the Ski ſhould not ſufficiently cover the Fleſh, convenient Bandage may with much mor Eaſe remedy this Inconveniency.

A certain ancient Chirurgeon did valu himſelf highly upon a certain Invention o his own, in the Amputation of mortifie Members; which he pretended to perform with the Help of a large red-hot Knife, ſo that he judged he might by ſo doing ki Two Birds with One Stone, *i. e.* he might a once make an Inciſion in the Fleſh, and Cauterization on the Veſſels: But I don know that this Method has been approve of, or followed by any.

Mr. *Botal* tells us of another Method o cutting off a Leg. He ſays, You muſt plac the Leg betwixt the ſharp-edged Irons; ſuc as the Butchers make uſe of ſometimes, an are faſtened to Two Pieces of Wood. Th Leg being placed upon the ſharp-edged Iro underneath, he lets the other fall upon it in the Nature of a Trap, and by this Mean he pretends to divide the Fleſh and Bones a once, and much quicker than can be expecte from the Saw. He tells us, that ſeveral Amputations of Legs have been made accordin to this Method, and that the Patients hav been well cured, without feeling any ex ceſſive Pain in the Operation.

I would not have you imagine, that I give you this Account concerning theſe va rious Opinions and Methods, with an Intent to intice you to put them in Practice; no but only to give you to underſtand, th there ariſe from Time to Time Variety o

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Sects in Chirurgery, as well as in all other Profeſſions: And ſo I will put a Concluſion to this Article, with a Relation of a certain Inſtance of an Amputation of a Leg, which happened about Twenty Years ago in the Hoſpital of the *Invalides*.

'One named *Rabel*, (whom I have had 'Occaſion to mention before) offered to 'Monſieur *Louvois* a certain Stiptick Water, 'which, he told him, would do Wonders, 'it being an infallible Remedy againſt all 'Sorts of *Hemorrhagies*; ſo that now it was 'their own Faults, if hereafter any of the 'King's Soldiers did die by the Loſs of 'Blood, for Want of this miraculous Water. 'To prove what he propoſed to be nothing 'but Truth, he asked Leave to make Trial 'of it; adding, that this was the only Way 'to convince all the World of the ſurpri-'ſing Effects of his new-invented Remedy. 'Monſieur *de Louvois* being overcome at laſt 'by theſe bold and ſpecious Aſſurances, or-'dered a Trial to be made of it upon one 'of the Soldiers in the Hoſpital of the *In-'valides*, whoſe Leg was to be cut off; and 'Monſieur *Duſhene*, Chief Phyſician of the 'Princes, was to be preſent, together with 'many other Phyſicians and Chirurgeons, 'at the Amputation, which was performed 'by the Chirurgeon of the Hoſpital.

'The Patient being after this delivered up 'to Mr. *Rabel*, who had brought all his Fur-'niture along with him prepared after his 'own Way, he made an Application of his 'Stiptick Water after his own Way, with 'ſuch Bandages as he judged moſt proper 'for the Stopping of the Flux of Blood; 'but ſcarce had he put the laſt Hand to it, 'but you might ſee the Blood to break out 'thro' all the Bands he had applied: So he 'ſaw himſelf neceſſitated to take off this 'Bandage, and to make uſe of another, and 'to double his Doſe; and beſides this, did 'every Thing elſe he thought proper to ſtop 'the Blood; but in vain, for the Flux of 'the Blood continued, and the Patient died 'under his Hands in the Preſence of all the 'Spectators.

The King and Monſieur *de Louvois* being informed of what had paſſed, *Rabel* was enjoined under a moſt ſevere Penalty not to make any Uſe hereafter of this Stiptick Water.

To conclude this Head, after a Chirurgeon who has been reduced to a Neceſſity of cutting off a Leg or Thigh to ſave the Life of his Patient; after, I ſay, he has performed the Operation and Cure with good Succeſs, the Patient nevertheleſs remains incapable of Walking, for Want of a certain Part, without which this Action is not to be performed; and conſequently, it is not ſufficient alone for the Chirurgeon to have ſaved his Life, unleſs he by his Induſtry ſupply alſo the Defect of that Member he has taken off by another, which may approach to the other, as well in its Compoſitions as its Figure.

This is ranged among the fourth and laſt Sort of the Chirurgical Operations, and is called *Protheſis* or *Protaſſis*, being derived from the Word *pros*, which ſignifies *before*, and of the Word *Tetein*, which implies as much as to *put*, to *ſet on*; becauſe by the Help of this Operation, we adapt or put a certain Inſtrument to the Body, to ſupply the Place of ſome certain Part that is loſt. A double Advantage is propoſed by this additional Operation; *Firſt*, For Ornament's Sake, as when, for Example, we put in an artificial Eye, or Teeth: And *Secondly*, for Neceſſity's Sake; as for Inſtance, when we put on a Wooden Leg or Arm; for without this Supply, that Part of the Patient's Body muſt remain unactive.

Tis ſufficiently known how a Wooden Leg is to be made to fit it for its Function, which is to be aſſiſtant in Walking; becauſe the laſt Wars have put a great Number of People upon a Neceſſity of making Uſe of them, inſtead of thoſe they had loſt in the ſeveral Sieges and Battles. So I will content my ſelf at this Time to put you in Mind only, that a Wooden Leg ought in its Bulk and Shape be exactly proportionable to the Sound Leg; that its ſuperior Part muſt be hollow, the better to embrace or incloſe the lowermoſt Part of the Thigh; that it ought to be provided with Ribbands, to tie and faſten it to the Thigh; and that it have a Bolſter, or be quilted in that Part where the Knee is to be lodged, leſt it ſhould receive any Hurt from the hard Wood, and that it ought not to be of brittle, but of firm and

tough Wood, that the Patient may uſe it with the more Security.

To correct the Deformity of a Wooden Leg, the beſt Way is to have one exactly ſhaped by a Carver, proportionable to the Figure and Size of the ſound Leg, and wear over it a Stocking and Shooe as before. If it comes up to the Thighs, *viz.* when the Amputation is made above the Knee, you may contrive it ſo as to make it bend in that Place when you ſit down by the Help of a Peg, which you may take out, and put it in again when you are to riſe and walk.

I knew a certain Officer in the Army, who by a long Cuſtom knew how to manage his Wooden Leg ſo dextrouſly, that he could mount on Horſeback with it, and would always charge with it where there was the moſt Danger. It happened one Time that his Wooden Leg was broken off by a Musket Ball, and ſo he cried out, I am not undone, becauſe I have ſuch another in my Trunk.

About a Year ago, or a little more, Father *Sebaſtian*, a *Carmelite* Friar, and one of the honorary Fellows of the Academy of Sciences, did preſent them with an artificial Arm made of Tin, of his own Invention, being provided with Variety of Springs, by the Help of which he propoſes, That when faſtened to the Stump of an Arm, a Man ſhall be able to manage or guide a Horſe, to write, *&c.* and to perform all the other Actions a Man is able to do with a natural Hand. He tells us, that the Springs being ſet to work by the ſole Motion of the Stump, you will be capable of moving your Wriſt and Fingers at your own Pleaſure. This Machine was not as yet brought to its full Perfection when the *Carmelite* preſented it to the Academy. If it anſwers the Deſigns for which it is intended, the mutilated Part of the World will be highly indebted to this good Father for ſo uſeful an Invention.

How to extract Extraneous Bodies out of the Humane Body. Taken out of the Tenth Demonſtration of the Chirurgical Operations. By the ſame Author.

DIvers Sorts of extraneous Bodies will oftentimes remain or ſtick in a Wound, eſpecially after Engagements; *viz.* Pieces of Darts or Javelins, or of Swords; as alſo the Fragments of Bombs and Granades, and very often whole Musket Balls, *&c.*

The ancient Chirurgeons could not tell us of any Thing beſides Darts, Javelins, and Swords, becauſe in thoſe Days they uſed no other warlike Inſtruments in their Engagements but thoſe; Muskets, Cannons, Bombs, and Granadoes, being Things quite unknown to them.

And tho' in our Times we don't make Uſe of Darts and Javelins in our Armies, a Chirurgeon ought nevertheleſs not be ignorant of the Method of extracting them; becauſe this Method may prove of ſingular Uſe to him and his Patients, in caſe they happen to go among ſome barbarous Nations, who being deſtitute of our *European* Arms, ſtill retain the Uſe of the old Weapons: And upon this Occaſion 'tis very obſervable, that the Iron Points of theſe Inſtruments uſed among the *Barbarians*, are much more difficult to be taken out than a Musket Ball, or a Piece of a Granado, becauſe theſe laſt may be extracted through the ſame Orifice of the Wound where they entered, whereas the former can't be taken out without making a new Wound oppoſite to that where they entered before, and that by Reaſon of their Triangular Figure.

Arrows or Darts are conveyed into the Body from a great Diſtance by the Means of a Bow; but Javelins are thrown near-hand by the Help of the Enemy's Hand.

When any one is wounded with either of theſe Two Inſtruments, you muſt endeavour its Extraction from that Place where it is fixed; but if you make uſe of your Strength to pull it out, the Arrow will perhaps break in Pieces, or the Iron of the Javelin will come off from the Stick unto which it was faſtened; theſe Irons being ſhaped in ſuch a Manner, that, generally ſpeaking, they will not

not come out thro' the ſame Orifice where they entered.

It belongeth therefore to the Chirurgeon well to conſider, whether there is any Probability of their being taken out thro' the Orifice of the Wound, and if he judges they may, he muſt dilate the Wound with the *Biſtouri*, *A.* without which it will prove impoſſible for him to effect it: But if he finds that there is a Neceſſity for his extracting theſe extraneous Bodies on the oppoſite Side, he muſt then make a new Wound or Opening, and then puſh it outwards by the Help of the Inſtrument, *B.* but take Care that the Wound be ſufficiently dilated. If it happen to be in the Arm or in the Thigh, you need not much diſpute to let it go forward thro' the Fleſh. After which you may convey a Seton thro' the Wound, which will contribute very much to its Conſolidation, and that with more Expedition than if the Weapon had been drawn out of the Orifice of the Wound, which oftentimes occaſions a Diſruption in the Muſcles, and conſequently an Abſceſs.

In caſe a Javelin be fix'd in the Breaſt or lower Belly, it proves a very hard Task to take it out, becauſe the wounded Party wants moſt commonly ſufficient Patience to ſuffer the Chirurgeon to dilate it at his own Leiſure; but on the contrary, are apt to turn to and fro, and conſequently cauſe ſuch a Dilaceration in the Part, that theſe Wounds moſt commonly prove mortal.

I remember, that at the Rehearſal of a Carouſel at *Verſailles*, a young Fellow was wounded with a Javelin which was aimed at a *Meduſa*'s Head. A Chirurgeon being at Hand, he dilated the Wound, immediately drew out the Weapon, and the Patient was cured in a very ſmall Time.

'Tis generally believed, that the Savages do poiſon the Irons of their Arrows and Javelins; and I have heard it ſaid alſo, that in our Engagements they make uſe likewiſe ſometimes of poiſoned Bullets. Doubtleſs ſome ſuch Thing may be practiſed among the *Barbarians*, but I can ſcarce imagine there ſhould be ſuch furious Beaſts in our Armies, that carry their Rage ſo far as to fight their Enemies at ſo barbarous and inhumane a Rate.

However, in caſe a Chirurgeon, by the Appearance of the Wound, or by its Symptoms, finds that the Weapon has been poiſoned, he muſt order his Patient Cordials, and dreſs the Wound with Unguents prepared with *Theriaca*, Turpentine, and the Oil of *Millepedes*.

Sometimes it happens that a Sword will break in the Wound, *viz.* when it hits againſt a Bone that ſtops its Entrance. If the Chirurgeon can get Sight of the Sword that made the Wound, he may, by what is remaining entire, judge of the Quantity that is left in the Wound; but in caſe the Wound be given in an Engagement, he muſt do as well as he can without it. If he feels the Piece of the Sword in the Wound, by the Help of his Probe he muſt dilate the Wound, and then endeavour to extract the Piece by the Help of his Pincers; but if it be fix'd in the Bone, he muſt with the Help of a Pair of Pincers ſhaped like a *Raven's-Beak*, draw it out in a ſtreight Line, leſt he ſhould wound ſome adjacent Veſſel or Nerve as he draws it out. The extraneous Body being extracted, he muſt dreſs the Wound after the uſual Method.

A few Ages ago a certain Fryar, a Chymiſt, did invent a Compoſition of Nitre and Sulphur, unto which they have given ſince the Name of Gunpowder; and divers Sorts of Fire-Arms, as Piſtols, Fuzees, Muskets, *&c.* have been invented for the Deſtruction of Mankind; and great Cannon, Bombs, *&c.* for the Ruin of the ſtrongeſt Ramparts, and great Cities. To improve which Deſtruction, there appeared not long ago at Court another Monk, who offered a new Invention of three Pieces of great Cannon join'd together, in ſuch a Manner that they might be diſcharged all three at once. How induſtrious is Mankind in contriving its own Deſtruction?

But to return to the Point in Hand; Fuzees, Muskets, and Carbines, are charged with Bullets of a different Calibre, or Bigneſs, according to the Diameter of the Muſſel. Theſe Leaden Bullets, when diſcharged at a ſmall Diſtance, will penetrate quite thro' the Body, or an Arm, or a Leg, unleſs they happen to be ſtopp'd by ſome Bone that lies in their Way. But in caſe the Shot

comes at a conſiderable Diſtance, it commonly is lodged in that Part of the Body where it made its Entrance; and then it belongs to the Chirurgeon to endeavour its Extraction: For ſo long as any foreign or extraneous Body remains behind in the Wound, 'tis not in the Chirurgeon's Power to heal it up; it being an undeniable Obſtacle to that Reunion which is the End propoſed in the Cure of all Wounds.

I would not however have you interpret my Words thus, as if no Wounds were cured where the Bullets have not been extracted: No, for I am ſenſible that ſuch Things have been done; but there are ſo few Inſtances of that Kind, that, if we may be allowed to take that which happens moſt frequently for a general Rule, we may poſitively aſſert, that in caſe any extraneous Bodies remain in a Wound, they hinder their Conſolidation; and that therefore we ought to make uſe of all the Means preſcribed in the Art of Chirurgery to draw or take them out with all poſſible Expedition. For if this Extraction be delayed, the Part will ſwell very big, and then you will find it a much more difficult Task to compaſs it, than if you had undertaken it ſoon after it was lodged in the Part.

A Chirurgeon therefore ought, before the firſt Dreſſing is made, to extract immediately the extraneous Bodies, unleſs he meets with inſurmountable Difficulties or Obſtacles, or is not provided with ſuch Inſtruments as are neceſſary for this Operation.

For this Purpoſe, the Art of Chirurgery does furniſh us preſently with divers general Rules and Precepts, and alſo with Inſtruments of ſeveral Kinds, which, if managed with Dexterity, will not fail to anſwer your Expectation, in extracting the extraneous Bodies out of a Wound. A Chirurgeon ought to be inſtructed in both, but thoſe that intend to practice in the Army above all others; and more eſpecially at this very Juncture of Time, when almoſt daily Opportunities offer themſelves to put in practice this Operation, after ſo many Bloody Engagements, and difficult Sieges, wherein the Officers and Soldiers daily expoſe their Lives for the Service of their Prince and Country.

At the ſame Time I can't forbear to put you in Mind in this Place, that after all the Inſtructions that can be given upon this Head to a young Chirurgeon, 'tis certain that the Army is the beſt School where he muſt improve and put theſe Inſtructions in Practice; and even then much muſt be left to, and expected from, his natural *Genius* and Judgment: There being ſo vaſt a Difference, and ſuch extraordinary Caſes happen, in theſe Wounds, his own Induſtry and Judgment muſt be his beſt and ſureſt Guide.

The firſt Thing a Chirurgeon has to do when he is to extract a Bullet, is to be informed at what Diſtance the Wound was given; for by this he may judge how deep the Bullet is lodged.

The next Thing to be done, is to put the wounded Party in the ſame Poſture he was in when he received the Wound, that ſo he may be able to convey his Probe the ſame Way that has been made by the Bullet; and then he muſt place his Hand on the oppoſite Side, to try whether he can feel the Bullet; for ſometimes it happens, that the Ball, after having paſſed through the Part, ſticks under the Skin, its Force being ſpent, and not able to pierce thro' the Skin.

If you can feel it in the oppoſite Part to that where it entered, you muſt with the *Biſtouri* make an Inciſion upon the Bullet according to its Bigneſs, and with the ſmall Pincers take it out. At the Orifice of the Wound, where the Bullet made its Entrance, you muſt make two ſmall Inciſions with the ſame Inſtrument, one above and another below, to change its Figure from a rotund into an oblong, then you muſt convey a Seton through the Wound, and heal up the Wound as is uſual.

In caſe the Ball be lodged in the fleſhy Parts, and you can feel it with your Probe, you muſt proceed immediately to the Dilatation of the Wound, without which you will find it impoſſible to make the Bullet come out the ſame Way it went in. Beſides that, this Dilatation is abſolutely neceſſary to convey the Inſtruments, by the Means of which the Bullet is to be taken out, into the Wound.

Of

Of theſe Inſtruments, there are various Sorts, known by the Name of *Bullet-Drawers*, (Tireballes); of which I have given you Twelve ſeveral Sorts of Figures, in a Cut prefix'd to this Demonſtration.

That which challenges the *Firſt* Place, is the *Dilater*, and anſwers Two different Ends.

Firſt, to dilate and enlarge the Wound, as well to give you an Opportunity to inſpect the Wound to the Bottom, as to make Room for the Inſtrument which is to take Hold of and to draw out the extraneous Body with the more Eaſe.

Secondly, to ſerve alſo inſtead of a *Bullet-Drawer*, becauſe this Inſtrument is capable of taking Hold of and bringing out this extraneous Body, without the Help of any other Inſtrument; with this Difference nevertheleſs, that in all the other Inſtruments deſigned for the Extracting the Bullets, you muſt cloſe thoſe Branches that are without the Wound; whereas in this you muſt open or keep them aſunder.

The *Second* is call'd the *Tireballe* with a Spoon, ſo call'd from its Figure like unto a Spoon. This Inſtrument is provided with a Haft or Handle, that you may hold it the faſter. It is long, that it may be able to reach to the extraneous Body; and after it is ſlip'd into its concave Part, which muſt be a little incurvated, you may bring it out; but take Care to do it gently, without too much Haſte.

The *Third* is the *Tireballe* like a Ring, ſo call'd, becauſe at its Extremity, which is to ſeize the Bullet, it is round, and ſhaped like a Ring, being that which encompaſſes the Bullet, and after it has taken Hold of it, draws it out with the ſame Facility it enter'd before.

The *Fourth* is the *Tireballe* with a blunt Hook, by the Means whereof it hooks in and draws out the Bullet. It muſt be long, that it may reach to the Ball, and be provided with a Haft, for the Conveniency of holding it well and firm with ones Hand.

The *Fifth* is the *Tireballe* with a bifid Hook, but ſo that the Points are blunted, leſt they ſhould wound the Parts. This Inſtrument is intended to hook in and pull out ſuch Pieces of the Shirt or Clothes, which moſt commonly enter to the Bottom of the Wound along with the Bullet.

The *Sixth* is an Inſtrument call'd the *Raven's-Beak*, the Branches of which, that enter the Wound in Search of the extraneous Bodies, are very long, that ſo they may be ſerviceable upon all Occaſions.

The *Seventh* is call'd the *Hern's-Beak*, from its Reſemblance to it. It is provided with a Spring, for its more convenient Dilatation after it is conveyed into the Wound, the better to catch Hold of and draw out the Bullet.

The *Eighth* is call'd the *Bec de Canne*, or the broad Beak; the Extremities of which are intended for the more convenient ſeizing and keeping the Ball.

The *Ninth* is the *Bec de Canne a Viſſe*, by the Means of which it keeps the Bullet ſo cloſe, that it muſt of Neceſſity come out together with the Inſtrument.

The *Tenth* is call'd the *Beak of a Lizard*, becauſe it has a Reſemblance to the Head of a *Lizard*. It opens only at its Extremity by the Help of a Spring, which is puſh'd forwards, and ſhuts again when the Spring is drawn back, being fix'd within a hollow Pipe or *Cannula* within the Body of the Inſtrument.

The *Eleventh* is an Inſtrument call'd the *Alphonſin*, having obtained its Name from *Alphonſus Ferier*, a *Neapolitan* Phyſician, its Firſt Inventer. It conſiſts of Three Branches, which are cloſed together by the Means of a Ring, by which they are incloſed. The Inſtrument thus cloſed together, is conveyed into the Wound to the Bullet, and then you draw back the Ring towards the Handle, and the Branches opening themſelves, take Hold of the extraneous Body: After this you muſt puſh the Ring forward again from the Haft, by which Means the Branches will graſp the Bullet with ſuch a Force, that the Bullet muſt of Neceſſity come out along with the Inſtrument.

The *Twelfth* is the *Tariere* or *Tirefond*, the Point whereof is a ſmall Screw, which you may fix into the Bullet, by turning it thro' a *Canula* or Pipe of the Length of the whole Inſtrument. This Inſtrument is of peculiar Uſe in the Extraction of thoſe Bullets that are fix'd within the Bones; but is not ſo

proper

proper for ſuch as are lodged only in the Fleſh, becauſe here they will give Way, and conſequently the Screw cannot enter or make a Hole ſufficiently deep into the Bullet.

'Tis next to an Impoſſibility to preſcribe any certain and ſtanding Rules, which of all theſe Inſtruments ought to have the Preference, every one of them being adapted more or leſs to ſome peculiar Uſe, according to the Diverſity of the Parts where the Bullet is lodged; and therefore it muſt be left to the Diſcretion of the Chirurgeon to pitch upon ſuch or ſuch a one, ſuch as he judges moſt ſuitable to the preſent Caſe, after having well weighed the Nature of the extraneous Body, and of the Place where it is lodged.

And after all, though the Art of Chirurgery preſcribes to us, and abounds in a vaſt Variety and Number of Inſtruments, there happen nevertheleſs oftentimes ſuch extraordinary Accidents and Occurrences where they ſtand the Operators in little Stead. In theſe extraordinary Caſes he muſt contrive ſome new Ones and give a Model of them, in order to have them made on Purpoſe by the Inſtrument-Makers or Cutlers, of ſuch a Size and Figure as he judges moſt proper to draw out a Bullet out of any Part of the Body, wherever it be; for a Patient muſt not be loſt, becauſe the Chirurgeon will tell you he is not provided with ſuch and ſuch an Inſtrument as is requir'd in the Caſe before him, unleſs there is an abſolute Impoſſibility of procuring them.

Nor is it ſufficient for a Chirurgeon to attempt the Extracting of a Bullet, or ſome other extraneons Body, out of a Wound, but it muſt be done alſo ſo ſoon as poſſibly can be; for you will find your Patient much more obedient at the Firſt Dreſſing of his Wounds than afterwards: At that Time they will ſubmit to Inciſions, or any Thing elſe the Chirurgeon thinks fit to be done.

I remember I have ſeen ſome Soldiers in the Army, who were ſo far from crying out, that they did not ſo much as frown whilſt the Chirurgeon was buſied in extracting a Bullet, a Piece of a Granado, or making ſome other neceſſary Inciſions, which were doubtleſs accompanied with exceſſive Pain. It behoves a Chirurgeon to improve this good Diſpoſition in the Patient, becauſe it ſeldom happens that the next Day, when their Blood is cooled, they are ſo tractable and willing to ſubmit to ſuch-like painful Operations.

Delay is alſo dangerous in this Caſe upon another Account, becauſe immediately after the Wound is given, you may find and draw out the Bullet with Eaſe, by following the ſame Tract the Bullet has made; but after the wounded Party has been walking or ſtirring any other Way, the Bullet will change Place; and if it be fix'd in an Arm or Leg, it will ſink downwards, and then you ſee your ſelf reduced to a Neceſſity of making much larger Inciſions, which after they are made, prove oftentimes uſeleſs, *viz.* when the Bullet does ſlip betwixt ſome Interſtice or other of the Muſcles.

There is a Third Reaſon ſtill againſt making any Delay in the Extraction of foreign Bodies, becauſe the Part being not tumefied the Firſt Day, you may with the more Eaſe find out the extraneous Body, and draw it out without much Pain; but in caſe you delay it to the next or the following Day, you will find the Part ſwell'd to ſuch a Degree by the Defluxions of the Humours that fall upon it, that it will prove a very difficult Task to follow the Tract the Bullet has made, becauſe the Orifice is drawn inwards, and the fleſhy Parts much ſwell'd and bloated: And in caſe you are then neceſſitated to make Inciſions, they will be much more painful than if they had been made at the Firſt Dreſſing.

It muſt be rank'd among the vulgar Errors to aſſert, that there are certain Remedies that are capable of attracting extraneous Bodies out of a Wound. What they tell us of the *Galbanum*, *Amber*, and ſome other Gums, muſt be look'd upon as Fables; and in this Caſe a Chirurgeon muſt truſt rather to his Inſtruments than to Drugs

Some Chirurgeons there are, who, without any further Ceremony, expect the Coming out of a Bullet by the Means of thoſe Symptoms that attend the Wounds given by Fire-Arms; and they think they have done extraordinary well, when they apply Leaven, Pigeons-Dung, and other ſuch-like putrifying Remedies to the Wound, in order to produce

produce a plentiful Suppuration, and an Abſceſs, in Hopes that the *Pus* will chalk out the Way, and carry the Bullet along with it. But this Method ſeems to me to be very dangerous, becauſe ſuch an Abſceſs cannot be made without creating exceſſive Pains, which producing a Fever, prolongs the Cure, and renders it very difficult, if not quite impracticable, without making certain Apertures to give free Paſſage to the Matter and the extraneous Bodies; and therefore I adviſe every Body to avoid this Kind of Practice, which has been invented by ſome Chirurgeons, who are more afraid of making Inciſions, than the Patients are of ſuffering the Pain.

It is further to be obſerved, That after you have taken out one Bullet, your Work is ſcarce half done, becauſe the Soldiers will charge their Muskets ſometimes with Two or Three Bullets at once; and at other Times, if their Bullets prove too big for the Muzzle of their Muskets, they will cut them in Four Pieces, and charge their Muskets with them all at once: And therefore it behoves a Chirurgeon well to ſearch the Wound, in order to be fully convinced whether there be any more than one, before he dreſſes the Patient.

I remember a certain *Swiſs* Officer, who being wounded in the anterior and middle Part of the Thigh, before the Citadel of *Cambray*, by a Musket-Ball, and the Chirurgeon having diſcovered the Bullet at the poſterior Part, when it lay under the Skin, made a ſmall Inciſion, and took out the Bullet through the Aperture; the Chirurgeon believing no otherwiſe than that there was but one Bullet lodged in the Wound, becauſe there was but one Orifice; whereas there were two of them fix'd there; for one happening to ſtrike againſt the Thigh-Bone, not being able to penetrate ſo far as the other, did fall by Degrees into the lower Part of the Thigh, and did not come out till Six Months after, through an Abſceſs upon the Knee.

After all the Bullets are taken out, there are ſtill remaining behind ſome other extraneous Bodies, which likewiſe require the Aſſiſtance of the Chirurgeon's Hand: Theſe are the Pieces of the Clothes, or of Shirts, which the Bullets carry along with and before them into the very Bottom of the Wounds.

In caſe you look upon the Patient's Clothes, and find a Piece of them taken out, of the ſame Figure with the Bullet, you may then be ſure it is lodged within the Wound, and therefore you muſt attempt its Extraction without Delay; without which, it will be impoſſible to procure a ſucceſsful Cure.

Thus it happened to Monſieur *Ponti*, who being wounded by a Musket-Ball at the Siege of *Londonderry* in *Ireland*, the ſame carried a Piece of his Coat along with it into the Wound. The Bullet being taken out, and yet there appearing but little Signs of a Reunion, no Body knew what to think of it; for from Time to Time there appeared Abſceſſes, which exhauſted all his Strength, and reduced him almoſt to a Skeleton; till a certain *French* Chirurgeon gueſſing at the Cauſe, made ſome freſh Inciſions, took out thoſe Pieces of Stuff that had hitherto prevented the Conſolidation of the Wound, and accompliſhed the Cure in a little Time after.

When we charge a Fuzee, we commonly put a Piece of Paper upon the Powder, and upon that the Bullet. In caſe a Wound be received by a Musket-Ball at a ſmall Diſtance, the Bullet may go through the Body, whilſt the Paper that comes after it is lodged in the Wound; a Thing that muſt not be neglected by the Chirurgeon, becauſe it happens pretty often to be ſo, and then it will prove impoſſible to heal up the Wound, as long as this extraneous Body remains in the Wound.

Neither is it ſufficient alone to take out all Sorts of extraneous Bodies, unleſs you remove alſo the Shivers of the Bones, which are apt to cauſe a pricking Pain and Diſturbance in the Wound, and conſequently hinder its Reunion.

'Tis obſervable, that there iſſues out but little Blood from the Wounds made by Fire-Arms, and it is rarely ſeen that they are attended with any exceſſive Flux of Blood, becauſe the Bullet burning the Fleſh as far as it goes, produces an *Eſcar*, which keeps the Blood from iſſuing forth, even though ſome Blood-Veſſels ſhould be wounded: But when this *Eſcar* comes to fall off, then it

it is that an Hemorrhagie does ſometimes enſue, which would prove fatal to the Patient, unleſs the Chirurgeon ſtops it without Delay; and for this Reaſon it is, that he ought to act with Circumſpection, and not to promiſe a certain Cure till the Eſcar is quite fallen off; for if it lies near one of the larger Veſſels, it may be of dangerous Conſequence.

Defluctions happen more frequently and more violently to fall moſt commonly upon Wounds given by Fire-Arms, than upon thoſe made by Iron Inſtruments; for theſe latter do only ſeparate and cut aſunder the Parts; whereas the former break and tear aſunder the Fibres of a Muſcle, which cauſes a Defluxion of the Humours upon the affected Part, and produces an Abſceſs, which renders the Cure extreamly difficult. For this Reaſon it is, that you muſt not attempt the Conſolidation of a Wound made by Fire-Arms with the ſame Expedition as thoſe given by the Sword: And you muſt always be upon your Guard, and prepared againſt ſuch Symptoms as are apt to ſupervene.

When the Bullet is fix'd within the Bone, you muſt endeavour to take it out by the Help of a *Tirefond*, or of the *Tariere*; but in caſe it be wedged in ſo cloſe, that it is impoſſible to take it out, you had better let it remain where it is, than to torment your Patient with vain and moſt violent Efforts: And in the mean while expect the Exfoliation of the Bone; for as that Part of the Bone which is touch'd comes to be ſeparated from the reſt, it will carry the Ball along with it.

In caſe the Bone ſtands upright when it is hit by a Bullet, it ſtops its Progreſs; but if the Bone inclines one Way or other, it ſtrikes along the Bone, and conſequently does either aſcend or deſcend, according to the Poſition of the Bone at the Time when the Blow is given.

Of this, I remember Two fatal Inſtances; one in the Prince of *Rohan*, who having received a Musket-Shot in the Knee, the Bullet was carried upwards along the Thigh-Bone; and another in Monſieur *de St. Mars*, who being ſhot in the Foot, the Ball did ſtrike upwards along the *Tibia*. They both died of their Wounds; the Cauſe whereof was laid at the Door of the Chirurgeons, becauſe they did not ſearch and diſcover the Bullets in thoſe Places where they were found to be lodged after their Death; tho' it muſt be confeſs'd that they did all that poſſibly could be expected to ſave the Lives of theſe Two brave Men.

If a Bullet happens to hit or ſtrike againſt the Skull, the Brain is quite ſtun'd by it; and whenever this happens, it is obſervable, that the Number of thoſe that die by ſuch an Accident, is much greater than of thoſe that eſcape with Life, becauſe this violent Commotion cauſes at all Times an Extravaſation of the Blood of the ſmall Veins, which are very tender in this Part. The only Remedy in this Caſe is the *Trepan*, to preſerve their Lives, to give Vent and Iſſue to the Blood; and therefore though the Skull be never ſo little touch'd and laid bare, you muſt have Recourſe to the *Trepan*; for though, as I told you, theſe Wounds are extreamly dangerous, yet there are frequent Inſtances of ſuch Perſons having been ſaved by the *Trepan*.

The Pieces of Bombs and of Granadoes do alſo make a moſt miſerable Havock wherever they light. I will not ſpeak here of the Bombs, becauſe thoſe that are wounded by them, are ſoon paſs'd all the Help of a Chirurgeon; but as for the Pieces of Granado-ſhells, I have frequently taken them out, and that out of all the Parts of the Body, excepting the Head; for thoſe that are ſtruck or wounded there, infallibly die, by reaſon of the Havock they make in the Skull, and the violent Agitation it cauſes in the Brain; ſo that the wounded Perſon is and remains ſtun'd, as if he had been Thunder-ſtruck.

When a Granado breaks in many Pieces, they penetrate into the Fleſh, more or leſs, according as theſe Pieces are either bigger or ſmaller, or according to the Diſtance of the Place where it happens to break.

At the Siege of *Cambray*, I drew a Piece of a Granado, of the Bigneſs of the Palm of my Hand, out of an Officer's Leg, which was enter'd ſo deep into the Fleſh, as to be undiſcoverable by the Eye. Mr. *Beſſiere* told me, that he had ſeen a Piece of a Granado-Shell lodged in the *Scrotum*; but be it where it will, it muſt be taken out, the ſooner the better, and that by Inciſions; concerning which

which, no certain Rules can be preſcribed here, it depending on the Judgment of the Chirurgeon, to ſuit them according to the Situation of the Wound, and the Nature of the extraneous Body that is to be taken out.

Cannon-Balls ought not to be number'd among the extraneous Bodies that require an Extraction, for they ſend in an Inſtant to the Grave whatever comes within their Reach; there being no Inſtance, that ever a Cannon-Ball was lodged in the Body of any Man, that after that had Occaſion for a Chirurgeon. If a Man is ſo fortunate as to come off with the Loſs of an Arm or a Leg, when he is ſtruct by a Cannon-Ball, his Chirurgeon muſt come to an Amputation; of which we have had Occaſion to ſpeak in another Place.

After a Bullet, or any other extraneous Body, is drawn out of the Wound, you muſt, before you dreſs it, have a Regard to Two or Three Circumſtances:

Firſt, to change the rotund Figure of the Wound into an oblong, by making Two Inciſions with the *Biſtoure*, *viz.* one in the upper, and the other in the lower Part, according to the ſtreight Poſition of the Muſcular Fibres.

Secondly, to make a Kind of a Gutter in the Wound, by dilating it in its lower Part, to promote the Effiux of the *Pus*, which elſe you will be obliged to do afterwards.

Thirdly, to convey a Needle, threaded with the *Seton*, through the Wound, in caſe it penetrates quite through the Part, for the more eaſie Application of theſe Remedies, by which the Conſolidation is to be accompliſhed.

At the Beginning, you muſt make Uſe of Digeſtives, to ſeparate the *Eſcar*; but this Digeſtive muſt be qualified or animated with other Ingredients, that they may not be altogether ſo much tending to Putrefaction, as thoſe are that are applied to the contuſed Wounds, leſt they ſhould produce an exceſſive Suppuration.

The *Eſcar* being fallen off, you lay aſide the Digeſtives, and endeavour to exſiccate the Wound by the Help of the vulnerary Water, which is of moſt excellent Uſe in theſe Sorts of Wounds, and which upon that Account has been ſtyled the *Gunſhot-Water*.

The Chirurgeon muſt put this Tent of Lint, mark'd with *V*. into the Wound, in caſe there is a Neceſſity for it; but if he has made Uſe of a Seton, there is no Occaſion for it. Upon the Wound, you muſt lay the Pledgit, *X*. which muſt be flat, and covered with the Digeſtive; then the Emplaſter, *Y*. and the Compreſs, *Z*. ſoak'd in *Aquavitæ*, or Aromatick Wine; and then you conclude your Dreſſing with the Band, *a*. or by the cloſe Bandage, made with the Band, *b*. roll'd together with Two Chiefs; and continue your Dreſſings according to the known Rules of Chirurgery.

Of FRACTURES. *Taken out of the Fourth Book of* Hieronimus Fabricius ab Aquapendente, *his* Chirurgia Univerſalis.

CHAP. I.

Of the Definitions, Differences, Cauſes, and Signs of Fractures.

IF there happens a Solution of Continuity in the Bone from an internal Cauſe, *i. e.* from ſome corroding Humours, it is called a *Caries* of the Bone; (of which, in another Place:) but when it owes its Riſe to an external Cauſe, it is call'd a *Fracture*, which is to be the Subject of the following Treatiſe; A Fracture is defined to be a *Solution of Continuity in the Bone, proceeding from ſome external Violences.*

The Differences of Fractures are taken from the Figure, Magnitude, and Variety, of the fractured Bones.

According to their Figure, a Fracture is either ſtreight, *i. e.* ſuch as is made to the Length of the Bone, or tranſverſe, which breaks it aſunder athwart, or oblique, which is a Compoſition of both the before-mentioned. *Secondly*, a Fracture is either large or ſmall. *Thirdly*, their Differences are taken from the Subject, *i. e.* from the fractured Bones themſelves, *i. e.* when either the *Os Femoris*, the *Humerus*, the Ribs, *&c.* are broken.

As to the Cauſes of Fractures, a corroding Inſtrument is very ſeldom to be reckon'd among them, as the actual Cautery; ſeldom a ſharp-pointed Inſtrument, but frequently a ſharp-edged or cutting, and moſt frequently of all a blunt, *breaking*, or *contunding* Inſtrument.

A Fracture without a Wound may be diſcovered, *Firſt*, by a Cavity, if you touch the affected Part with your Finger below and above the Fracture. *Secondly*, when you handle the fractur'd Member, it will make a Kind of a cracking Noiſe in the Place where it is broken, occaſioned by the Colliſion of the fractured Extremities of the Bone. *Thirdly*, there is much Pain, ariſing from the Divulſion of the Nerves, and the Diſtortion of the nervous Bodies, or from the pricking of ſome acuminate Part of the broken Bone upon a nervous Body. The *Fourth* Sign is an Impotency in the fractured Member, to keep it upright, and to bear or lay any Streſs upon it: And the laſt Sign is, when ſome of the before-mentioned Cauſes have preceded, and are followed at the ſame Time by theſe Signs.

Theſe are the Signs which are at all Times obſervable in Fractures: But beſides theſe, there is ſometimes to be ſeen alſo a Diſtortion and Shortneſs in the fractured Member, but not always.

If the Fracture be accompanied with a Wound, you may, beſides the before-mentioned Signs, diſcover the Fracture alſo by the Help of your Finger or Probe, by the Aſperity you may feel on the Bone. This relates to the tranſverſe Fracture; but if the Bone be fractured according to its Length, the Member is thicker, beyond its natural State, it is painful and unequal.

As to the Prognoſtick, a Fracture of the Bone is not without Danger, becauſe there muſt of Neceſſity happen an exceſſive Solution of Continuity; for if a Wound be received in the fleſhy Part, this Solution of Continuity does not extend beyond the Part which is wounded by the Inſtrument; but if there happens a Diſruption in the Bone, it is fractured all at once, by reaſon of its Rigidity and Continuity.

A Fracture is not without Danger alſo, becauſe it is made deep, and in ſuch Places as lie out of the Reach of the Chirurgeon's Hand. However, ſome Fractures are more dangerous than others, becauſe a Fracture is much more difficult to be cured in a large than in a ſmall Bone; a Compound more hard than a Simple; one with a Wound, than without a Wound; one near the Joint, than that which is at a good Diſtance from it.

CHAP. II.

How to prevent Inflammation in Fractures.

REunion is the Thing required in the Cure of Fractures; but this Reunion cannot be expected, unleſs you take Care to prevent an Hemorrhagy and Inflammation. As to the Hemorrhagy, it never happens in the Bones, as it does in the fleſhy Parts, unleſs the Fracture be accompanied with a Wound, becauſe none of the conſiderable Veins and Arteries are carried to the Bones; but Inflammations are much to be dreaded here, and much more than in the fleſhy Parts; for the Pain cauſes an Attraction; the Weakneſs of the affected Part cauſes an Efflux and Generation of the excrementitious Humours, which cannot be expell'd by the fractured Part. What encreaſes the Danger the more, is when the Bones are covered with abundance of Fleſh.

The

The Inflammation muſt be prevented by removing the Cauſes, which muſt be performed by the ſame Means as uſed to be applied to the ſimple Fleſh-Wounds; ſuch as have been preſcribed in the Second Book, and Fourth Chapter.

CHAP. III.

Of the Cure of the tranſverſe Fracture without a Wound: And Firſt, *How the fractured Extremities of the broken Bone muſt be ſet together.*

AS to what relates to the Cure of Fractures, we will begin with that of the tranſverſe Fracture without a Wound.

The Reunion of the Bone is the true Indication in the Cure of this Fracture, which cannot be accompliſhed by the Firſt Intention, unleſs it be in young Infants, but very well by the Second, to wit, by the Intervention of a *Callus*, which grows betwixt and conjoins the fractured Parts together; ſo that here you have Five ſeveral Intentions before you: *Firſt*, the exact Setting of the fractured Bone; *Secondly*, the Keeping them together after they are well ſet; *Thirdly*, to take Care of the Preſervation of the adjacent Parts; *Fourthly*, to endeavour the Generation of *Callus*; and *Fifthly*, to correct any ill Accidents.

In order to accompliſh the exact Setting of the fractured Parts, there will be requir'd an *Extenſion* and *Coaptation*:

For becauſe in Fractures, but more eſpecially in the tranſverſe Fractures, the Bones ſuffering a Diſtortion, the Streightneſs of the Member is impaired or loſt, ſome of the Parts being prominent, whilſt others are contracted into a Cavity. And becauſe one fractured Extremity of the Bone will paſs over the other, the Member muſt of Neceſſity grow ſhorter, becauſe the Muſcles always draw the Member towards their Originations: So that *Extenſion* is abſolutely neceſſary, in order to reduce the fractured Parts of the Bones, which are diſpoſſeſſed out of their direct Station into a ſtreight Poſition, and to inſert the Prominencies into their Cavities.

And though it may happen ſometimes that the fractured Member ſeems not to be ſhorter than it ſhould be (as for Inſtance, when it conſiſts of Two Bones, and One of them is only broken; or when one of the fractured Extremities of the Bone is not thruſt over the other); nevertheleſs, if ever you expect to accompliſh an exact Coaptation, you muſt firſt of all of Neceſſity make an Extenſion in all tranſverſe Fractures; without which, there will be great Danger of breaking the Prominencies of the fractured Extremities of the Bone, in the turning, directing, and tubbing together of the fractured Extremities in the Coaptation; and if theſe ſharp Prominences happen to be broken off, they will either fall betwixt the Extremities of the Bones that are to be ſet together, and conſequently prevent the Coaptation, or elſe they drop without them, and produce moſt violent Pains, either by the Diſtention or Pricking of the nervous Parts.

However, you muſt keep a *Medium* in your Extenſion; for if it be done beyond Meaſure, it will cauſe exceſſive Pains, and conſequently a Fever, Convulſions, Reſolutions, and ſometimes alſo a Divulſion in the Muſcles, as *Galen* tells us. On the other Hand, if the Extenſion be not ſuch as is requiſite, this will ſerve only to cauſe a Colliſion in the fractured Prominencies of the Bones, which will be apt to break them, without attaining to your End, which is the Repoſition of them into their proper Cavities.

Hence it is, that the great Bones and large Muſcles, which draw the affected Member with a great Force towards their Originations, do require alſo a very ſtrong Extenſion; ſuch are the *Os Femoris*, next the *Humerus* and the *Tibia*, then the *Cubitus*, and after theſe the Bones of the Hands and Feet.

The *Radius* requires the leaſt Extenſion among all the other Bones, becauſe this Bone has no Muſcles which draw it upwards, it having no other Motion than that of Pronation and Supination.

Due Regard muſt alſo be had to the Figuration of the Member, *i. e.* that the Member may be extended in ſuch a Manner, as may occaſion the leaſt Pain; and this is performed if the Fibres of the Muſcles are ſtretched out directly, and the whole Muſcle be kept in the ſame Part of the Member.

Children, and ſuch as are of a ſoft Conſtitution or Habit of Body, will bear a much harder and ſtronger Extenſion than thoſe of an advanced Age, and ſuch as have ſtrong and hard Muſcles.

The Chirurgeon muſt alſo make Reflection upon the Time of the Fracture, *i. e.* if he be called the Firſt Day, he may then venture upon a much ſtronger Extenſion; but if after the Firſt Day, he muſt either make no Extenſion at all, or at leaſt a very gentle one, for fear of an Influx of the Humours, and an enſuing Inflammation.

There are Three Sorts of Inſtruments belonging to this Extenſion; *Firſt*, the Chirurgeon's Hand, which may ſerve in ſlight and ſmall Extenſions; *Secondly*, Ropes and Bridles, for a middling Extenſion; and *Thirdly*, Inſtruments and Engines, for the ſtrongeſt Extenſions.

After you have looſened or relaxed your Inſtruments made Uſe of in the Extenſion, your next Buſineſs is to make an exact Coaptation of the fractured Extremities of the Bones, which, whether it be done as it ought to be, you may know by the Three following Signs:

Firſt, if the fractured Member be the ſame with the ſound oppoſite One in its Figure; *Secondly*, if by feeling or preſſing with your Finger upon the fractured Part, you do not perceive any nonnatural Cavity, Aſperity, Prominency, or Inequality; and *Thirdly*, if the Pain is allayed.

CHAP. IV.

How the fractured Parts of the Bones are to be retained, after they have been ſet together.

THE Second Intention in the Cure of Fractures, is to preſerve the fractured Parts in their Poſition after Coaptation, which muſt be done by Deligation; and is to be managed in ſuch a Manner, as both to retain their united Parts, and to prevent alſo Inflammation.

Hippocrates makes Uſe of Three Rollers or Deligations made of Linen, ſuch as is neither too thick nor too thin, leſt it ſhould either cauſe a Compreſſion, or elſe break aſunder. The Firſt Band or Roller he does roll Three Times round the Fracture, then he rolls upward a good Way upon the affected Member, ſo as to make Three, Four, or more Circumvolutions.

By rolling your Linen Roller Three Times about, the Fracture is kept firm and ſteady, and the Humours are check'd, which might cauſe an Inflammation, as well thoſe that are flown that Way already, (for which Reaſon Three Circumvolutions are made about the fractured Part) as thoſe alſo that might be apt to fall that Way, eſpecially from the Parts above (for the inferior Veſſels do by Degrees dwindle away into nothing); for which Reaſon it is that the Roller is carried upwards.

The Second Roller, which is as long again as the former, he rolls about contrary to the Firſt; as for Inſtance, if the Firſt be roll'd towards the Right, this muſt be roll'd towards the Left Hand; ſo that in caſe one of the Muſcles ſhould by the Firſt Deligation be drawn too much towards one Side or Part, it may be put backwards by the Means of the Second Roller.

This Roller is to be roll'd but once round about the Fracture, and afterwards to be carried downwards, (in order to preſs out the Humours that were flown to the Part before) by making Three, Four, or more Circumvolutions a good Way down the Member, if Occaſion ſhall require. From thence you muſt aſcend upwards again with your Roller, paſs on with your Circumvolution over and beyond the Fracture it ſelf, till you come to the End of the Firſt Roller, where you muſt alſo terminate the Second Roller.

This Roller (as I told you) is firſt roll'd about the Fracture, to preſs out the Humours thence; afterwards it is carried downwards, to ſtop the Humours which might ariſe from the inferior Parts up to the Fracture, by reaſon of its Weakneſs, and becauſe there is great Fear of Defluctions of the Humours from the Parts above; for this Reaſon *Hippocrates* does not terminate his Roller below, but carries upwards by Circumvolutions, in order to bind it up where the former terminates. Theſe Two Rollers contribute more towards the preventing Inflammation, than the keeping ſteady of the Fracture, the Firſt requiring many Circumvolutions.

This done, *Hippocrates* applies to the Fracture certain Pieces of Three or more double-folded Pieces of Cloth, of the ſame Length as far as the Rollers do reach, but ſo narrow, that Five, Six, or perhaps more of them, may be placed or adapted round about the Fracture. Theſe being covered with a moderate Quantity of Cerote, (for if you put too much, it will melt, but not ſtick) are applied according to the Length of the Bone about the fractured Part; ſo that there remain about the Space of One or Two Fingers Breadth betwixt each of them.

They are call'd *Plagulæ* and *Splenia*, from their oblong Figure, and ſerve inſtead of agglutinating Remedies; beſides that, they allay the Pain, by hindering the Compreſſion of the Rollers.

The Third Roller of *Hippocrates* is deſigned for to keep on theſe *Plagulæ*. The Beginning or the Firſt Circumvolution of this Roller is made upon the Fracture; after which, one of the Heads of this Roller is carried upwards, and the other downwards. 'Tis further obſervable, that you muſt wind your Rollers ſtreighter about that Part where the Fracture is, than in others, the better to prevent the Fluxion of the Humours upon the fractured Part.

Celſus has left us another Method of making Deligations: Firſt of all, he applies about the Fracture Pieces of Linen Cloths, dipp'd in Oil and Wine; after which he makes Uſe of no leſs than Six Rollers; The Firſt is very ſhort, being roll'd Three Times about the Fracture, and Three Times more about the upper Part of the Member; the Second, which is half as long again as the Firſt, begins at the Fracture, and is roll'd downwards, and then upwards again, and ends at the ſuperior Part of the Member beyond the End of the Firſt Roller. Theſe are actually the Two Firſt Rollers of *Hippocrates*. Over theſe he applied a broad Piece of Linen Cloth, cover'd with a little Cerote, ſo as to reach over the beforeſaid Rollers, and to the oppoſite Part to that where the Bone ſtands out, (for the fractur'd Member will retain a Propenſity toward that Side towards which it was bent in the very Act of the Fracture) he always applies a Piece of Three or more double-folded Cloth, dipp'd alſo in Oil and Wine.

L. 8. c. 10.

I ſometimes make Uſe of Linen Cloths, ſometimes of Tow, which I dip in Red Auſtere Wine, when my Intention is to corroborate, or to prevent Inflammation, or elſe in the Whites of Eggs, when there is no great Pain, and I intend it only for the keeping of the Fracture firm.

Celſus does dip it in Wine, and in *Ol. Roſ.* for the moſt Part, *viz.* when there is great Pain; and after the Application of the broad Piece of Linen Cloth, he orders the Circumvolution of the other Four Rollers, ſo as that the following be always roll'd contraryways to the preceding, that the Third terminates in the lower Part of the Member, but the other Three in the upper Part thereof.

So that you ſee there is a Difference betwixt *Hippocrates*'s Bandage and that of *Celſus*; for the Firſt makes Uſe of Three, but the latter of Six. *Hippocrates* uſes the *Plagulæ*, and *Celſus* inſtead of theſe a broad Linen Cloth. The Firſt makes Uſe of Cerote, the latter of Wine and Oil. In caſe of great Pain, *Celſus*'s Bandage ſeems to be moſt proficuous; but where is little or no Pain, that of *Hippocrates* is the beſt; and is approved by the Authority of *Galen*. Our modern Chirurgeons immediately bind up the fractured Part with a double-headed Roller.

L. 6. c. 5.

The beſt Signs that your Deligation or Bandage is made as it ought to be, are, when the Patient is well able to bear it; when it makes

makes a gentle Compreſſion, ſo as both to contain and keep firm the fractured Part, and to preſs out the Humours. Beſides which, there are ſome other Signs which don't appear till the next Day: For when the Patient, that Day when the Bandage is made, finds it pretty ſtrait, and the next following Day there appears a lax, ſoft, and light Swelling, (*viz.* in the Hand, if the Fracture be in the Arm; or in the Foot, if it be in the Leg) you may then conclude your Deligation to be good, it being a Sign that the Humours are preſſed out from the fractured Part: But if there appear either no Swelling at all, or elſe a very great and hard Tumour the next Day (in the Hand or Foot) your Bandage is not rightly made; for in the firſt Caſe it is not ſtrait enough to retain the fractured Part, and in the latter it is too ſtrait, and will produce Inflammation.

On the Third Day of the Firſt Dreſſing, *Hippocrates* looſens his Bandage or Rollers, becauſe by that Time they begin to be relaxed, which is one Reaſon why they muſt be opened. Another Reaſon is, becauſe in Fractures the Patient is moſt frequently peſtered with intolerable Itching, cauſed by the Humours and Vapours that are detained and rendered acrious by the Deligation. As this Itching oftentimes is followed by a painful Excoriation and Inflammation, then the Bandage muſt be taken off, and the Part that is affected with the Itching be fomented with warm Water, to further the Evaporation; after which you may again apply the Bandage.

After you have made a proper Bandage, and the Itching is laid in the affected Member, you muſt keep it on without ſtirring it from the Third to the Seventh Day, and on the Seventh open it again, bathe it in warm Water, and bind it up again.

But now a-days, inſtead of the *Plagulæ*, we make uſe of the *Ferulæ*, as *Hippocrates* calls them; inſtead whereof our Chirurgeons make Uſe of Splinters made of thin Lamels of Wood, ſuch as they make the Scabbards of Swords of, which they cover with Toe: Others make uſe of Paſtboard or thick Paper; Some of Splinters of Wood of the Thickneſs of a Finger.

Theſe Splinters are deſigned not only to keep the fractured Part firm and ſteady, but alſo ſtrait. The Paſtboard and thick Paper, if they be dip'd in Oil or Wine, will be pliable and adapt it ſelf to the Member; but the thick Wooden Splinters are apt to cauſe a Compreſſion and Inflammation; and therefore *Hippocrates* did not apply theſe till after the Seventh Day; becauſe before the Seventh Day the Indication of preventing Inflammation was more urgent than that of retaining the Fracture, whereas the Contrary was to be obſerved after the Seventh Day.

CHAP. V.

How to preſerve the true Tone of the Subſtance of the Bone.

THE Third Intention of the Cure of the Fractures is, the Preſervation of the Subſtance of the Bone in its due Tone; for Nature, *i. e.* the natural Temperament of the Bone, can't make a Reunion of the Bone unleſs the Part be ſound.

For conſidering that there is a Weakneſs in the fractured Part, and that conſequently the Excrements of the Body are apt to fall that Way, and that alſo, by Reaſon of its weak Concoction, abundance of Excrements are ſeparated, which can't be expelled; and that beſides all this, in a fractured Bone, tho' it be never ſo well ſet, there will remain certain ſmall Caverns or Interſtices, which are afterwards fill'd with a *Sanies*; therefore, I ſay, for the Preſervation of the Part in its natural State, we ſtand in need of ſuch Medicaments as will dry up the Humours that are flown to that Part, and hinder the Influx of the reſt, which, to be ſhort, are called *Adſtringents*.

Of theſe, there are various Sorts in Uſe: *Hippocrates* did uſe Cerote, and after that auſtere Wine; *Celſus*, Linen Cloths dip'd in Oil and Wine.

Among the Moderns, ſome make uſe of Linen Cloths preſſed out of red auſtere Wine; and

and ſome Toe inſtead of Linen alſo preſſed out of Wine; ſome Oil and Wine together, and mix with them Powders of *Bol. Armon. Sang. Drac. Myrtil. Balauſt. Roſar. Rubr.* equal Parts each.

Others, beſides theſe Powders, beat up the White of an Egg, which they lay over it with Toe, or a broad Piece of Linen Cloth. Others there are who mix the aforeſaid Powders with the Whites of Eggs and red auſtere Wine, and apply it thus round about to the fractured Member, without either Tow or Linen Cloths; for when the White of the Egg is dry'd, they adhere very cloſe to the Part; and others bind Rollers over them dip'd in red auſtere Wine to keep it on the better.

In Relation to the Uſe of theſe Remedies, you muſt conſider the different Ends for which they are intended; to wit, *Firſt*, to prevent Inflammation: *Secondly*, to preſerve the true Tone of the Subſtance of the fractured Part; and *Thirdly*, to allay the Pain, due Regard muſt alſo be had to the Seaſon of the Year, Habit of the Body, Age of the Patient, and the Magnitude of the Fracture.

If therefore there be great Pain, the Cerote of *Hippocrates* ſpread upon a broad Linen Cloth is very uſeful, and over this you muſt apply another Linen Cloth preſſed out of red auſtere Wine, to prevent Inflammation.

If the Cerote be made of Wax, and *Ol. Roſ. vel Myrt.* it will aſſwage the Pain by Reaſon of the Oil, and will prevent a Phlegmon, and ſtrengthen the Fracture by Reaſon of its Adſtriction.

If there be but little Pain, it muſt nevertheleſs not be neglected, tho' the main Intent is to prevent the *Phlegmon*, and ſtrengthen the Fracture; and therefore we make uſe of *Ol. Roſ.* Wine, and Whites of Egs, wherewith we mix the before-mentioned Powders to the Conſiſtency of a Honey, and then apply it either with a Linen Cloth or with Tow.

But in caſe there be no Pain at all, we apply all our Endeavours to prevent Inflammation, and ſtrengthening the Fracture, and therefore we leave the Oil out. If there be a ſtrong Habit of Body in the Summer Seaſon, and a large Fracture, we mix the beforeſaid adſtringent Powders with the Whites of Eggs, and add *Cort. Granat. Gall. immatur. Succ. Hypociſtid.* and apply them with Stupes, and over them a broad Linen Cloth preſſed out of Wine, or in caſe you don't care for ſo many Linen Cloths, you may preſs the Firſt and Second Roller out of red Wine, and then bind up the Fracture with them.

By the Means of theſe Remedies you may preſerve the Tone of the Subſtance of the Part, which muſt all of them be applied before you make your Bandage.

After the Deligation, you muſt take Care alſo of the due Poſition of the affected Member. This, according to *Hippocrates*, muſt be laid ſoft, that no Pain may be raiſed by Compreſſion; it muſt be even, that it may cauſe no Diſtortion; it muſt be laid ſomewhat high, to keep the Humours from falling downwards.

For this Reaſon it is that our Chirurgeons lay the fractured Member in a Bed, and tie it up in a ſoft Pillow or Coverture; or they take a Piece of Paſtboard, and make it up hollow in the Shape of a Pipe, which they cover with Tow on the Inſide; and this they apply about the *Cubitus*, or any other fractured Bones, where the Patient is not obliged to keep his Bed. But when the Patient muſt be detained in Bed, nothing is more proper than to cauſe a Kind of a Wooden Caſe to be made of thin Boards, and ſtuff it up every where with Tow or Wool.

You muſt in the Poſition of the fractured Member, as well as in the Extenſion and Deligation of it, have due Regard to the true Figure of the Member; whereby you will prevent Pain, and keep the Muſcles entire on both Sides. This is the middle Figure, or that Poſition wherein each Member ſtands or lies when we are idle: As for Inſtance, the angular Figure in the *Cubitus*, the ſtrait in the *Carpus*, *&c.* being an intermedious Poſition betwixt the extreme Motions of each Member. Unleſs you be careful in obſerving this Poſition, the Member will grow painful ſoon after.

CHAP.

CHAP. VI.

Of the Generation of the Callus *in Fractures.*

THE Fourth Intention in the Cure of the Fractures, is the Generation of the *Callus*; and this muſt be done ſo ſoon as the Inflammation is ceaſed, which is moſt commonly about the Seventh Day; but ſometimes ſooner, ſometimes later, according to the Magnitude of the Fracture, the Seaſon of the Year, Age and Habit of the Body of the Patient. For whilſt you ſtand as yet in Fear of any Defluctions, 'tis in vain to endeavour the Generation of the *Callus*, becauſe if Nature be out of Order, ſhe can't attend the Generation of a *Callus*.

The *Callus* is produced by the Nouriſhment of the Bone, which breaking forth by Way of Exſudation thro' the Extremities of the Fracture, is concreted about the broken Part. Thus, tho' it be actually no Bone, it is ſo hard, that in caſe the ſame Bone happen to ſuffer a Second Fracture, it will ſooner break in another Part than in that where the *Callus* is ſettled.

So that here you have Two Indications; *Firſt*, That there may be a due Supply of Matter fitted for a *Callus*; and *Secondly*, that it may not be waſhed from the Edges of the fractured Bone, or be thruſt outward.

As to the Matter of the *Callus*, the Patient ought to feed upon incraſſating Meats, and ſuch as are viſcid; as boil'd Wheat, Heads, Feet, and Tripe of Veal and Mutton, Cowheels, and ſuch-like. He muſt alſo drink red and thick Wines, becauſe Liberty of Diet is very proficuous in this Caſe.

You may order alſo certain internal Medicaments, ſuch as are ſaid to have a Vertue of producing a *Callus*; as the Juice of the *Primula veris* taken for many Days ſucceſſively, the Powder of the Root of Agrimony taken in Wine, or its Juice taken by it ſelf.

External Applications, ſuch as have an emplaſtick Vertue, muſt not be neglected. Thus we make an Emplaiſter of *Farin. Volatil.* and *Album Ovi* for Women and Children; but for the Uſe of adult Perſons you may prepare the following Emplaiſter.

Rſ. Boli Armen. Thuris, Myrrhæ, Aloes, Acaciæ, Tragacanthæ, Ladani, Gallarum, Nucum, Cupreſſi, ana Part. æqual. in Pollin. redacti. miſs. cum Album Ovi, and a little *Farin. Volatil.*

We make uſe alſo of the *Decoct. Granat. & Folior. Myrtill. Rad. Ulmi, Rad. & Fol. Fraxin. Succ. Vitis, Alb. &c.* With theſe you may embrocate, after you have taken off the Bandage, before you apply the Emplaiſter again.

Among other Remedies, our Chirurgeons make uſe, in theſe Caſes, of the *Empl. Barbarum*, and of the *Oxycroceum*, during the Winter, Spring, and Autumn Seaſons, becauſe they are hot; but of the *Diapalma* in the Summer Time.

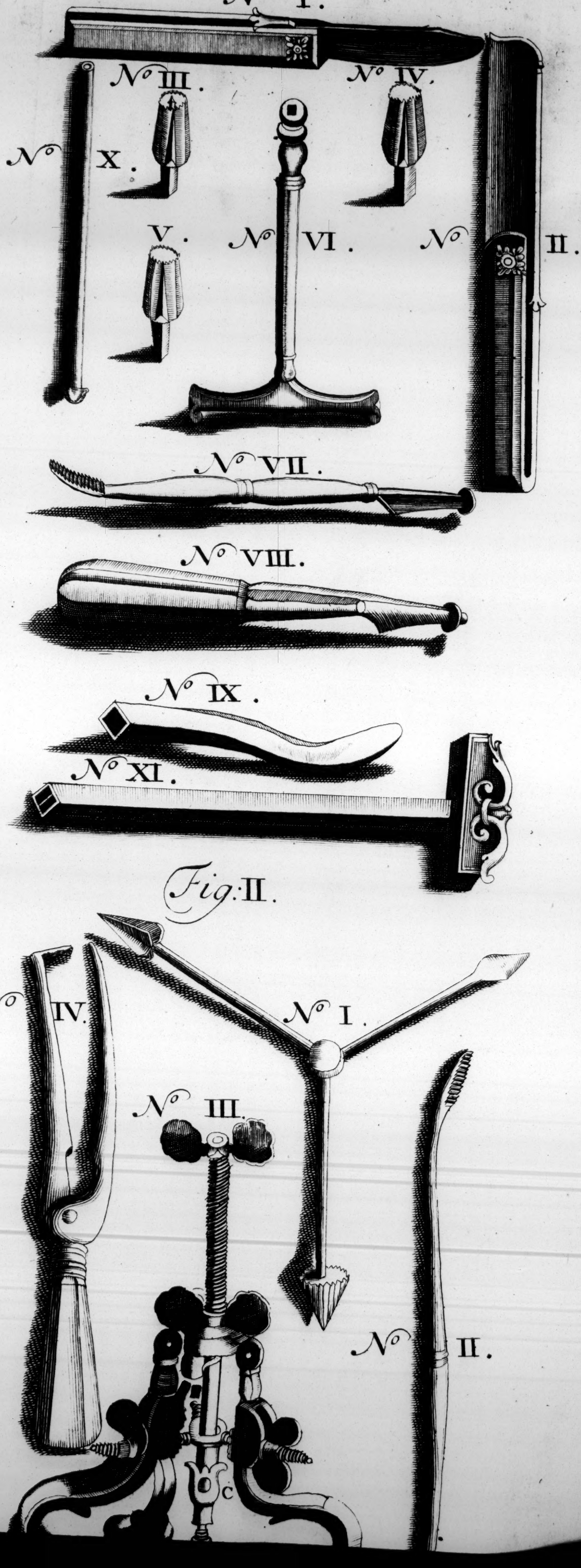
To prevent the Matter which is to produce the *Callus* from being thruſt outwards, you muſt alter your Bandage; for now it is no more Time to make your Deligation ſo as to preſs out the Humours, but to retain them, in order to their Concretion at the Fracture.

Hence it is, that you muſt not open your Dreſſing or Bandage ſo often as before, but only once in Five Days. You muſt alſo relax your Circumvolutions, tho' the Firſt Dreſſings need not be kept on ſo long, that ſo you may have an Opportunity of ſeeing how the *Callus* does proceed; whether it be ſo big, and ſuch as you would wiſh it ſhould be, and how you ought to manage your Point, when the *Callus* is either too big or too little, ſhall be ſhewn hereafter.

In Fractures that are made according to the Length of the Bone, the Cure is the ſame as in tranſverſe Fractures; with this Difference only, That you muſt make your Bandage more ſtrait.

CHAP.

Fig: I.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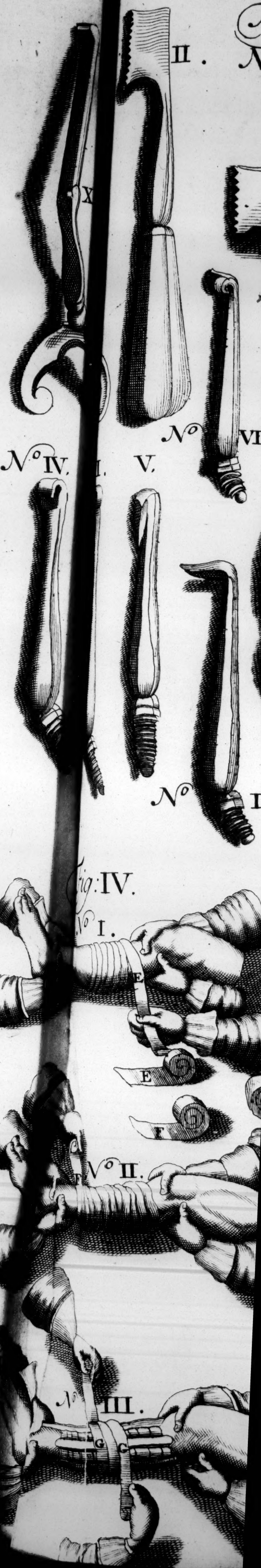
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Fig: III.

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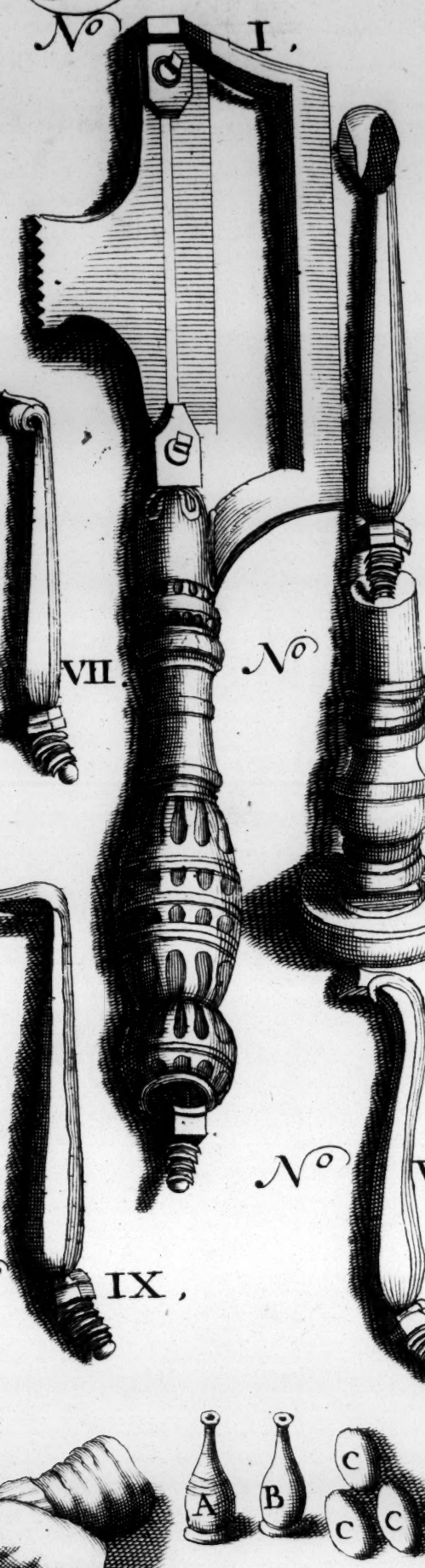

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Fig: VI.

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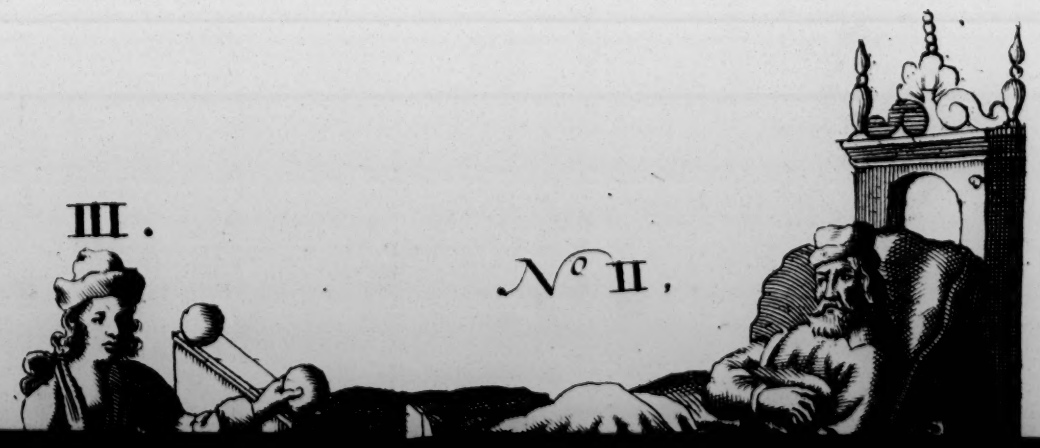

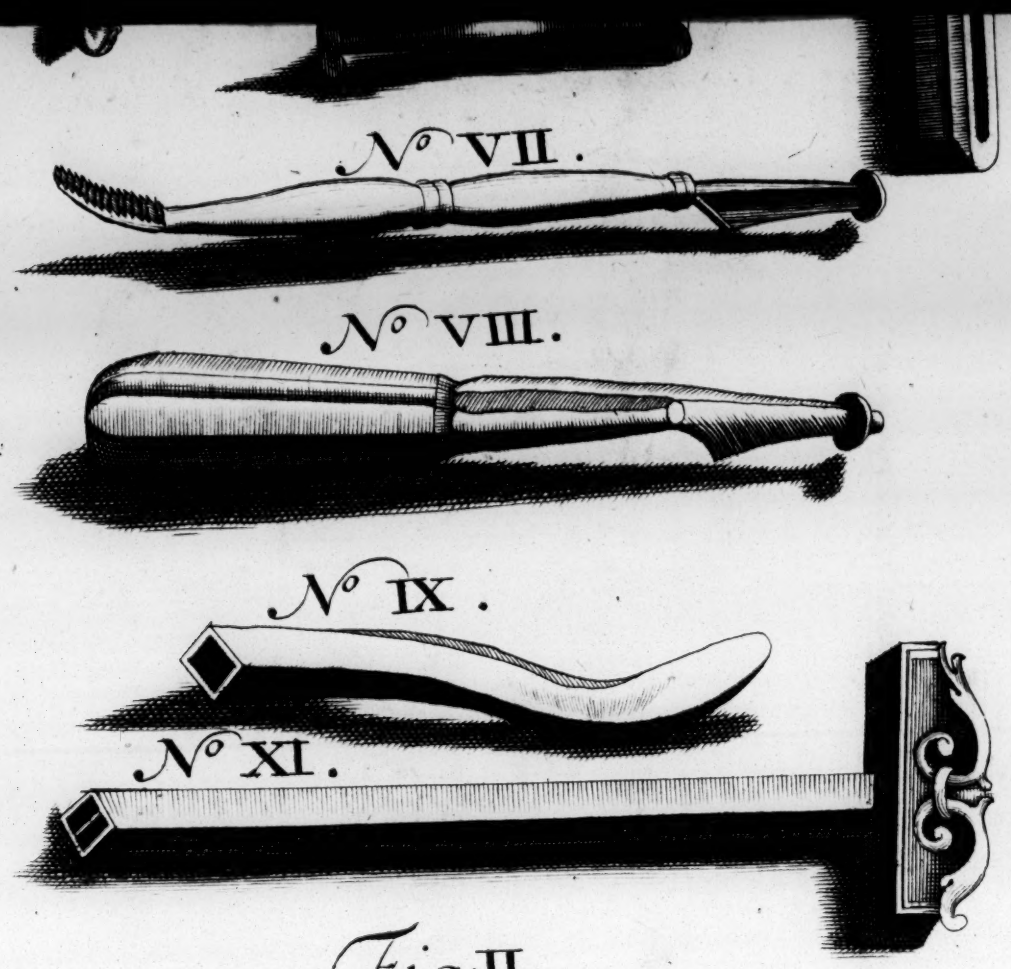

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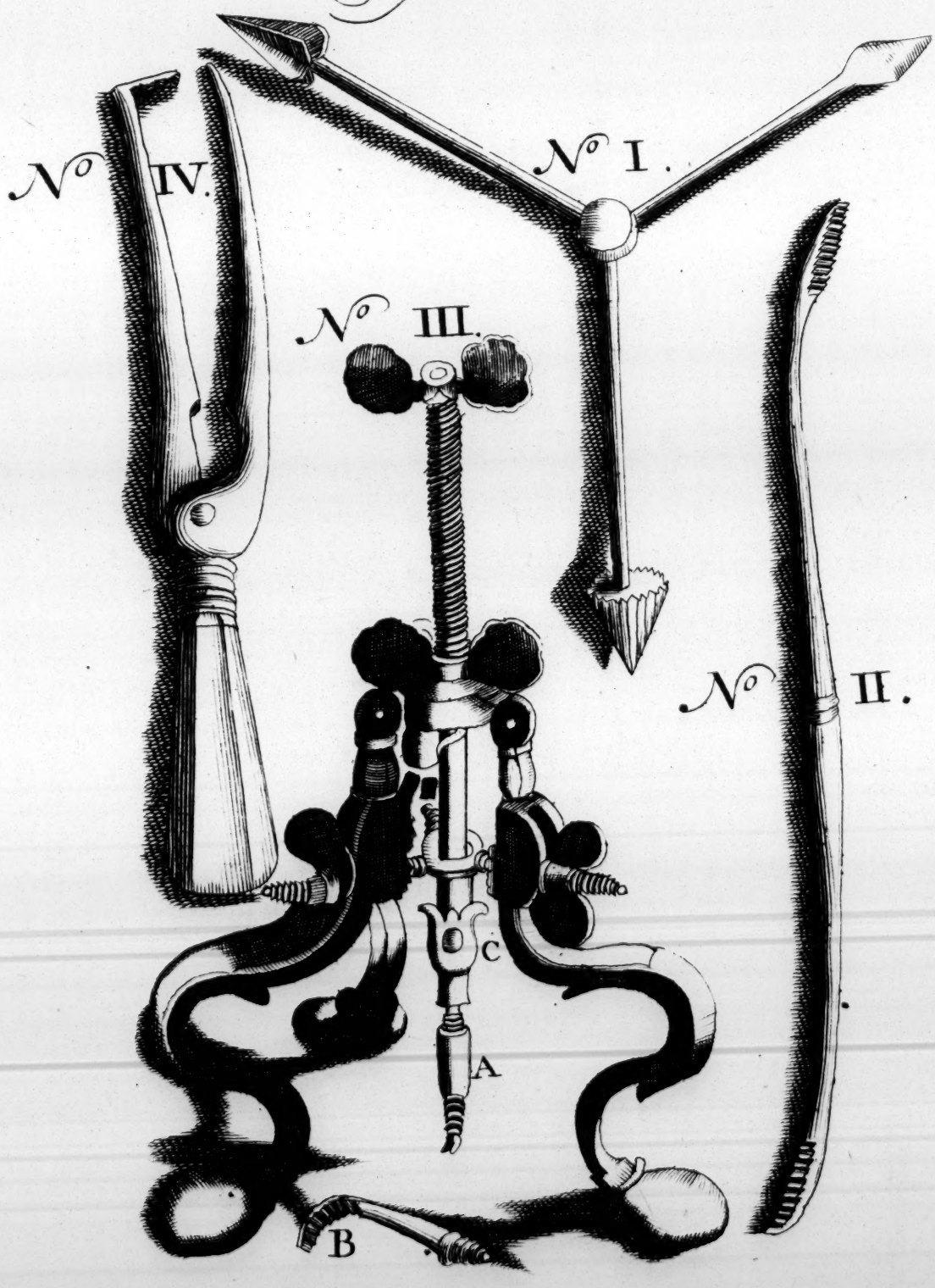

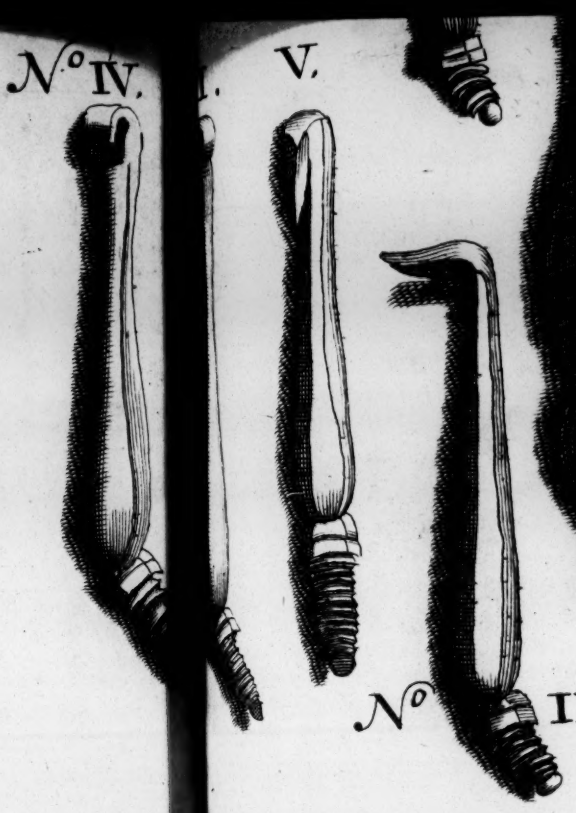

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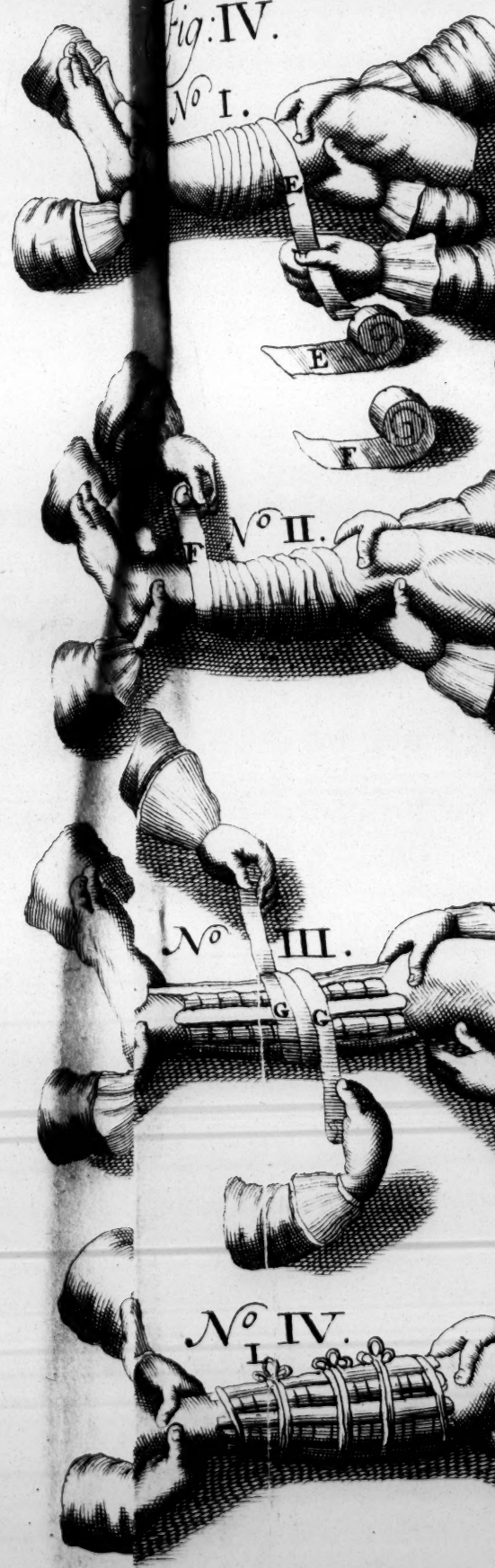

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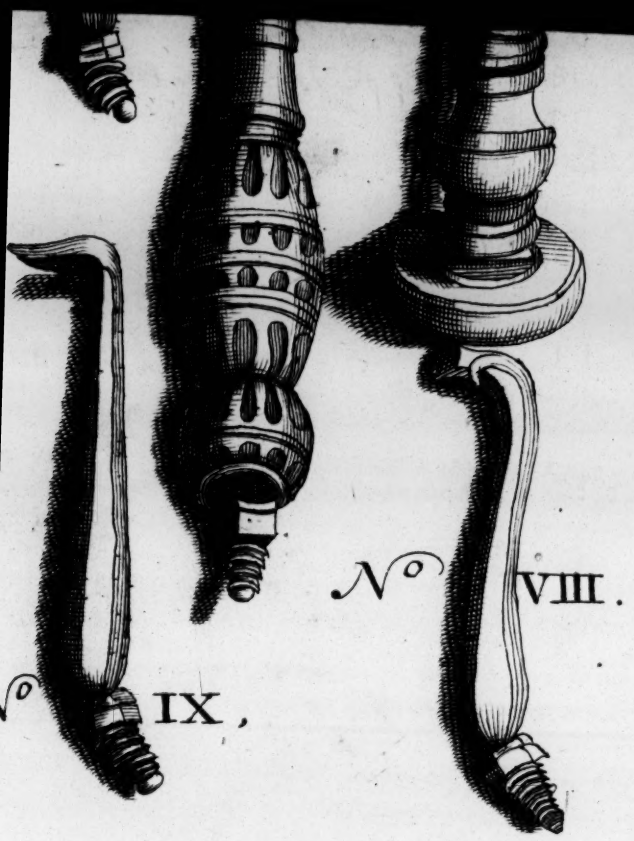

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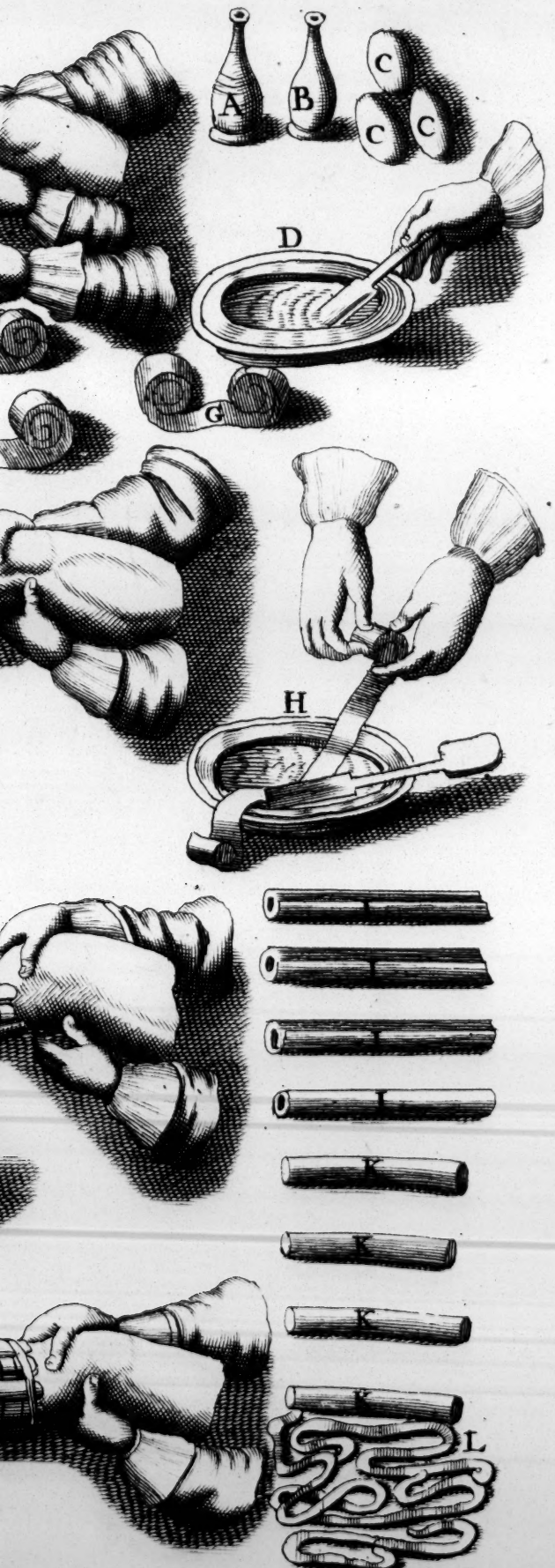

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CHAP. VII.

Of the Symptoms that attend Fractures.

WE are now come to the Fifth Intention of the Cure of Fractures, which is, to correct ſuch ill Symptoms as uſually attend Fractures, and retard their Cure. Theſe are, Pain, Inflammation, Itching, Excoriation, a *Callus* bigger or leſſer than it ought to be, a Weakneſs of the Member, an *Atrophia*, in the ſame a depraved Figure, a Gangrene, and a Wound.

If there be much Pain, you muſt aſſwage it by Anodyne Remedies; as Wool infuſed in Oil and Vinegar, mix'd and boil'd together, by the Help of a Spunge preſſed out of *Ol. Roſ.* and applied to it; by an Unction of *Ol. Chamæm. & Lumbricor.* over which you muſt lay a Linen Cloth dip'd in red auſtere Wine; all which muſt be applied warm. *Hippocrates* preſcribes an excellent Cerote, eſpecially if it be made with *Ol. Roſ.* You may foment it alſo with a Spunge preſſed out of a Decoction of *Malva* and *Chamæm.*

We told you before, that you muſt prevent Inflammations; but if there be an Inflammation already, you muſt apply the following Remedy:

Rs. *Rad. Althææ, Flor. Chamæm. Violar. ana Unc. j. contuſis & coctis in Aqua; adde, Farinæ Hordei, Unc.* iv. *Sapæ Unc.* iij. *Ol. Roſ. Viol. ana Unc.* iij. *Vini nigr. aut Aq. Hord. q.ſ. Miſce, pro Cataplaſmate.*

In Caſe there be an Exceſs of Heat:

Rs. *Fol. violar. balauſt. Plantag. ana Unc. jſs. Flor. Chamæm. Unc. j. decoq. in Aqua, & cum Ol. Roſ. & Chamæm. æqual. Part. ſimul miſtis, fiat Cataplaſma.*

In Caſe the Inflammation is in a State of Declination, you may make uſe of a Fomentation made of Chamemil Flowers and Betony boiled in White Wine; or elſe, of Roſes and Chamemil boiled in the ſame Manner.

If the Part be affected with Itching, by Reaſon of the Detention of the Humours, bathe it with warm Water, in order to open the Pores, and diſperſe the Vapours and flatulent Humours: Or elſe, you may foment the Place with a Spunge preſſed out of warm Water. Sea-Water may be made uſe of in the ſame Manner, which cleanſes and opens the Pores, by Reaſon of the Salt wherewith it is impregnated.

If you neglect to take this Itching in Time, it will end in a painful Excoriation; and ſometimes alſo in an Inflammation. This you muſt endeavour to remedy by drying and refrigerant Medicaments. If therefore it happen in the Summer-time, the *Unguentum de Ceruſſa* will be very uſeful; but if it be in the Heat of the Summer, you may uſe the *Unguentum de Ceruſſa Camphoratum.* If it be in the Summer, and a Body of a very hot Conſtitution, the *Unguentum Populeon* is very proper; as alſo that called the *Linimentum Simplex* freſh made. At other Seaſons of the Year, the *Unguentum e Lithargiro*, and the *Unguentum de Minio*, are very uſeful. All theſe are drying and refrigerant Remedies, but differ only in Degrees.

The *Callus* is ſometimes leſſer, and at other Times bigger than it ought to be. The Signs of a *Callus*, when 'tis too little, are, that the affected Part moves, but very weakly; and when you put your Finger exactly upon the fractured Part, you will either feel nothing at all, or elſe very little of a *Callus.* The Reaſon of it is, becauſe the Patient has been kept to a too ſlender Diet, and has fed upon ſuch Meats as were neither viſcid nor thickening; as alſo, becauſe the Bandage has been made and kept too ſtreight. You muſt therefore endeavour its Increaſe by a more plentiful Diet. You muſt relax your Deligation, and moderate your adſtringent Applications. You may endeavour to attract or draw the Humours thither by bathing it with warm Water; but let it not be too warm, leſt the Humours ſhould evaporate again, till the Part begins to be red, and begin to ſwell, for then it is Time to deſiſt.

If the *Callus* be overgrown, you may diſcover it by Contact; for if you preſs upon the muſculous or nervous Parts, it will be

painful, and the Part will be render'd unfit for Motion, by Reaſon of the Pain and Compreſſion. In this Caſe you muſt take a quite contrary Courſe to what has been mentioned in the former, in relation to the Diet, the Bandage, *&c.* This done, you muſt endeavour to ſoften and digeſt the *Callus* with Emplaſters made with the Roots of *Althæa* and the Leaves of *Malva* and *Melilot*, boil'd in Water with the Fat of a Duck: But before you apply this Emplaſter, you may bathe it with the ſame Decoction. After Emollition, you may bathe it alſo with Water, in which have been boil'd *Betonica Scabioſa*, *Scordium*, and *Parietaria*, which you muſt continue ſo long till the Part becomes red and ſwell'd, as alſo till it falls down again, and is corrupted.

If there be a Gangrene, you muſt waſh and bathe the Part immediately with a *Lixivium*, in which have been boil'd *Scordium* and *Plantain*; after which, apply an Emplaſter made of *Farin. Lupinor. Pulv. Scord. & Oxymel. cum Modic. Lixivio.*

If you obſerve an *Atrophia*, or extraordinary Leanneſs remaining in the affected Member, occaſioned either by the too ſtreight Deligations, or exceſſive Bathing, or Motion, or of his Diet, the Patient muſt be order'd a more liberal Diet: After which you muſt adminiſter Bathings with River-Water, in which if you order a good Quantity of Meat to be boiled, it will be the more efficacious. You may alſo apply a Pitch-Plaiſter, ſpread upon a hard or ſtiff Piece of Cloth, and then pull it off haſtily, which will cauſe a Pain by its firm Adherence to the Hair, and this Pain will attract Nouriſhment to the affected Member. You may alſo bathe it with warm Water.

It often happens, that after a Fracture is cured, the Member nevertheleſs remains diſtorted or depraved in its Figure, becauſe the Bones were not well ſet together. This is occaſioned either by the Ignorance of the Chirurgeon, or the diſorderly Motions of the Patient, or ſome Defect in the Deligations.

If this Diſfigurement of the Member be not exceſſive, or not very inconvenient in Reſpect to its Motion or Functions, the Patient had better acquieſce, and reſt contented with his Lot. And even in caſe this depraved Figure in the Member be conſiderable, and at the ſame Time the Patient be well advanced in Years, and weak, the *Callus* of an old Standing, and the Fracture in one of the large Bones, the beſt Advice I can give him, is to reſt ſatisfied under his Misfortune

But in caſe the Patient be young, of a robuſt Conſtitution, the *Callus* freſh, and the fractured Bone but ſmall, the only Way is to break the *Callus* afreſh; but before you go about it, you muſt for many Days together as much as is poſſible endeavour the mollifying of the *Callus* with the Decoction of *Althæa*, *Malva*, *Far. Cicutæ*, *&c.* You may alſo apply the *Empl. e Fol. Cicutæ, cum Axung. Porcin.* After which you muſt break the *Callus* afreſh, either with your Hands, or if it be too hard, with an Inſtrument, and then heal it up again, as has been ſaid before.

CHAP. VIII.

Of the Cure of the Fractures with Wounds, in which neither the Bone is bared, nor any Shiver of the Bone broken off.

IN the Fractures with Wounds, the Bone is either laid bare or not. Beſides which, ſometimes there is Reaſon to ſuſpect, that a Piece or Shiver of the fractured Bone is broken off, and ſometimes not. We will in the Firſt Place treat of that Fracture with a Wound, where neither the Bone is bared, neither is there any Suſpicion of a Shiver being ſeparated or to come off.

In the Cure of this Fracture, due Regard muſt be had, as well to the Indication of the Wound as of the Fracture, and that alternatively.

Firſt of all then, you muſt attempt the Coaptation of the Bones by Extenſion, as has been ſhewn before in the Firſt Intention of the Fractures.

Next

Next to this, a Reſpect muſt be had to the Second and Third Intention of the Wounds, *i. e.* the Lips of the Wounds muſt be brought together, and retained either by Suture or Bandage.

After this you muſt endeavour to ſatisfy the Third Indication of Fractures, and the Fourth of the Wounds, *i. e.* to preſerve the true Tone of the Subſtance of the fractur'd and wounded Part, by applying proper Remedies over the Wound after it is ſtitch'd up, and the Fracture reduced, ſuch as will aſſwage the Pain, if there be any, and prevent Inflammation, *i. e.* ſuch as will hinder or repel the Influx of the Humours, or elſe dry up and preſs them out; ſuch are the adſtringent and agglutinative Remedies: Of which, we have ſpoken more at large before.

For the preſent, if there be great Pain, you may make Uſe, in the Winter Seaſon, of the Pitch'd Cerote; if it be in the Summer, of the *Ceratum Roſaceum*; and at other Times, of the *Ceratum Simplex*.

If there be no great Cure, your main Buſineſs muſt be to ſtrengthen the Fracture, and prevent Inflammation: To anſwer which Intentions, you muſt apply Stupes dipp'd in Whites of Eggs, or a Linen Cloth preſs'd out of Red Wine and *Ol. Roſ.*

If there be no Pain at all, you may apply alſo the before-mentioned adſtringent Powders, mix'd with well-beaten Whites of Eggs.

This done, you muſt proceed to the Deligation of the Fracture. And here it is obſervable, that your Rollers muſt be both broader and ſofter than thoſe made Uſe of in Fractures without Wounds, that ſo they may be capable of containing the Lips of the Wound on both Sides, and keep them cloſe together, without cauſing a Compreſſion upon them. Neither muſt the Rollers be tied ſo ſtreight as if there were no Wound, leſt by the Compreſſion of the Wound, great Pain and a *Phlegmon* ſhould ariſe. Hence it is, that both *Hippocrates* and *Celſus* make a great many Circumvolutions, becauſe it is much ſafer to make many Windings, than to ſtreighten the Bandage at once.

Your Bandage muſt be opened once every Third Day, and not to be made ſtreight, as long as there is any Fear of Inflammation.

The *Ferulæ*, or Splinters, muſt not be made Uſe of in this Caſe, for fear they ſhould cauſe a Compreſſion upon the Wound; and therefore, in caſe we are obliged to apply them, they muſt not be placed upon the Wound; but in this Caſe it is much better to make Uſe in their Stead of many Rollers. *Celſus*'s Deligation with Six Rollers is moſt proper here.

CHAP. IX.

Of a Fracture with a Wound, in which the Bone is not bared, and yet we ſuſpect a Piece of the Bone to be ſeparated or come forth.

BY the Separation of a Bone we underſtand, when a Part or Piece of a Bone is added or diſunited from the reſt of the Bone, and is thruſt outward by Nature. This may happen, *Firſt*, when a Bone is dried up, or dwindled away by an old Ulcer, for then that Part which is dried is ſeparated from the reſt, and an Abſceſſion or Exfoliation of the Bone will enſue.

This may happen alſo without a Fracture, as in *Fiſtula's* and old Ulcers, where the *Sanies* by its long Continuance upon the Bone cauſes a Corruption in the Bone.

This Exfoliation happens ſometimes alſo in ſlight Fractures, by reaſon of the Quantity of the *Sanies*: *Secondly*, there happens alſo a Separation in the Bone, when, thro' the Violence of the Fracture, a Piece of the Bone is either quite ſeparated from the reſt, or elſe is ſo much bruiſed by the Concuſſion, that it is very near ſeparated from the reſt.

The Cauſes therefore are, either ſome external Violence or Force, or elſe a Corruption of the Bone, ariſing either from a *Sanies* that has lain too long upon the Bone,

or elſe from the Alteration of the external Air, which is apt to corrupt the Bones, and to introduce a great Alteration in their natural Temperature.

There are many Signs which forebode the Separation of a Piece of a Bone.

Firſt, there is a greater Quantity of *Sanies* than what is ſuitable to the Bigneſs of the Wound; which ſhews, that there is a Corruption in the Bone, and that conſequently there will be a Separation.

Secondly, the Wound ſeems always to endeavour an Excretion; whence it is, that the Lips of the Wound will not keep together, but rather draw inwards; and if the Patient makes an exact Obſervation, he will find ſome Motion or Irritation in the innermoſt Part of the Wound.

Thirdly, if the Bones are deprived of their true Conformation; for then, by reaſon of the *Sanies* which lies there, and corrupts the Bone, ſome Part of it muſt be caſt off.

Fourthly, if the Bone be quite bared of the Fleſh, a Separation muſt of Neceſſity enſue, becauſe it is deprived of its conſtant Supply of Nouriſhment, for the Veins and Arteries do now no more ſtretch to the bared Part; and the Bone will alſo ſuffer a Corruption, by its being expoſed to the external Air.

Fifthly, if there be any ſpongeous Fleſh growing on the Lips of the Wound, it will not admit of a Cure; for Nature never heals up a Wound as long as there is any extraneous Body within it, and this will conſequently cauſe a Separation in the Bone.

As to what relates to the Cure, if the Piece of the Bone is quite ſeparated from the reſt, ſo as to fall and lay looſe within the Wound, you muſt take Hold of it, and draw it out with a Pair of Pincers. But in Caſe a Shiver or Piece of a Bone be divided from the reſt by a Fiſſure on all Sides, yet ſo as to remain ſtill in its Place, this, becauſe it can never be reconſolidated, muſt alſo be taken out, provided it may be done without great Violence; but in caſe it is not to be done without it, it muſt be let alone, becauſe it would occaſion a Fever, Pain, Inflammation, Convulſions, and the Ulcer might perhaps turn fiſtulous; for by the violent Extraction of the Piece of the Bone, the Cavity would be fill'd with a *Sanies*, which by its Corroſion would hinder the Generation of the Fleſh. In this Caſe, it is the ſafeſt Way to leave this Expulſion to Nature, which by Degrees will progenerate new Fleſh at the Edges of the ſound Part of the Bone; and this will make the Bone to caſt off, as has been obſerved in the Wounds of the Head.

'Tis further to be conſidered, whether the Piece of the Bone that is to come off be large or ſmall, which you may gueſs at by the before-mentioned Signs, according as they are more or leſs remiſs. Thus if the Suppuration comes on but ſlowly, if there be a great Quantity of *Sanies*, and much ſpongeous Fleſh, you may conclude the Piece of the Bone to be pretty large; but if the contrary happens, you may judge it to be but ſmall. *Hippocrates* has left us Directions for the Cure of either of them.

If the ſeparated Piece of the Bone be ſuppoſed to be but ſmall, Care muſt be taken that the *Matter* be not detained within the Wound, and the ſound Bone be corrupted. You muſt therefore endeavour the diſcharging of the *Matter*; but this muſt not be attempted by Expreſſion, by Means of ſtreight Bandages or Rollers, (as in the Fractures without Wounds) for this would produce Pain and Inflammation; but you muſt give it Vent in ſuch a Manner, that of its own Accord it may diſcharge it ſelf out of the Wound.

The Second Intention is, to further the Separation of the Bone, which in the ſmaller Bones muſt be left to Nature, but in the larger muſt be furthered by the Help of proper Remedies or Applications.

Hippocrates recommends looſe Bandages, and often repeated, leſt the purulent Matter ſhould be detained within, which muſt have Vent given it for its Diſcharge: For this Reaſon alſo, and to prevent Compreſſion, he does not make Uſe of the *Ferulæ* or Splinters, which would cauſe Pain: The reſt he leaves to Nature.

'Tis farther obſervable, that though you expect a Separation of the Bone, you muſt nevertheleſs ſtitch up the Wound; for Nature will not endeavour the healing of the Wound in that Part where the Bone is to be ſeparated. You may alſo ſtrengthen the

Fracture,

Fracture, by the Application of ſeveral Rollers, as has been ſaid before. If you expect a large Piece to be ſeparated, the Cure differs from the preceding in Two Things; for you muſt make Uſe both of proper Medicaments, and of a peculiar Way of Deligation.

The Indications are, not to detain or intercept the purulent Matter, but to further its Diſcharge; to ſtrengthen the Fracture; to prevent Inflammation; to take Care not to cauſe Pain; and laſtly, to promote the Separation of the Bone as ſoon as may be.

To anſwer all theſe Intentions, in reſpect to Deligation, you muſt make ſeveral *Plagulæ* of Linen Cloth fixed together. Theſe muſt be of ſuch a Length, as to reach once round the Member, (for if they were ſhorter, they would not keep the Fracture firm and ſtable) but not ſo long as to go twice about it, (for if they are too long, they would only prove incommodious when you are to renew your Dreſſings) in order to retain the Fracture, and that ſo, by looſening the Two Heads, the Wound may be viewed without ſtirring the Member.

The Breadth of theſe *Plagulæ* muſt be at leaſt half an Hand, but in the main ſuch as to be able to comprehend as much as is requiſite the Lips of the Wound. They are to be applied ſo from both Ends, that they may decuſſate one another in Form of a Croſs, or that they may decuſſate on the oppoſite Part at a ſmall Diſtance from their Extremities.

There muſt be as many of theſe *Plagulæ* as are neceſſary, that no vacant Space be left betwixt them; for I ſpeak it upon my own reiterated Experience, that it is much better to make Uſe of more than of too few of them, for the ſtrengthening of the Fracture; yet you muſt take Care not to apply ſo many of them, as to cauſe thereby a Compreſſion upon the Part.

They muſt be dipp'd in Red Wine that is thick and auſtere, and then they will ſtick the better, and are good to prevent Inflammation, as alſo to preſerve the Tone of the Subſtance of the Part: Upon which Account it is, as alſo to prevent a *Phlegmon*, that *Galen* not only dips the *Plagulæ* in Wine, but alſo bathes the Part for a whole Day and Night, or elſe applies Linen Cloths and Spunges dipp'd in Wine.

But before you apply theſe *Plagulæ*, 'tis neceſſary you ſhould make an Application of certain Medicaments, by Means whereof you may in the Beginning, *i. e.* as long as the Inflammation does continue, both aſſwage the Pain, and check the Inflammation; as the *Ceratum Roſatum*, or the *Ceratum Picatum*; eſpecially at that Time when the Suppuration is at Hand, for it prevents a *Phlegmon*, by furthering Concoction and Suppuration; for when the Matter is once brought to a Suppuration, there is no Danger of any ſiniſter Accidents; but if otherwiſe, you muſt expect Pains, and ſometimes Convulſions. *Hippocrates* did ſometimes make Uſe of Linen Cloths dipp'd in Wine and Oil mix'd together.

The Time of Inflammation being over, you muſt make it your main Endeavour to accelerate the thruſting out of the ſeparated Piece of Bone as ſoon as may be, which, though it be the Work of Nature, yet may be promoted by proper Medicaments, ſuch as are hot, as old Oil, yellow Wax, *Sordities Vaſorum Apum ad Ignem liquata*, mix'd with *Euphorb.* part *j. Tithymolli*, part. ij. *Ariſtoloch.* part iij.

This Medicament is to be made Uſe of in the Winter in adult and robuſt Perſons; But in other Seaſons of the Year, in other Conſtitutions, the *Ammoniacum* and *Bdellium*, diſſolved in *Ol. Lilior.* are proficuous.

The Aſhes of Earth-Worms are ſaid to extract the ſeparated Pieces of Bones, by a certain occult Quality. You muſt mix them with Honey, and ſo apply them. The *Ceratum Sacrum* will alſo extract the Bones by its Heat.

CHAP.

CHAP. X.

Of the Fracture with a Wound, when the Bone is bared.

WHEN the Bone is bared, you muſt keep the Air from it, to prevent its Corruption: Therefore if the bared Bone is not thruſted out of the Wound, it muſt be covered; but this muſt not be done with Abſtergents, which will irritate and cauſe Pain, nor with Lenients and oily Remedies, which will make it putrid, but with its natural Tegument, *viz.* the Skin. You muſt therefore draw and keep the Lips of the Wound together by Sutures, and then compleat the Cure as in ſimple Fractures with a Wound.

But in caſe the bared Bone be thruſt out of the Wound, if you can reduce it into its proper Cavity by a moderate Extenſion, you muſt then ſtitch up the Wound as beforeſaid; but if it be thruſt out ſo far, that it cannot be reſtored into its proper Place without great Violence, then you muſt cut off a Piece of that Bone by Means of a Saw, File, or ſome other Inſtrument, and then endeavour its Reſtitution by a moderate Extenſion, which is much better than either to leave ſuch a Bone unreduced, or elſe hazard the Patient's Life by too violent an Extenſion.

But in caſe, after you have thus ſhortened the Bone, it will nevertheleſs not be reſtored to its proper Place without an exceſſive Extenſion, ſo that by the Overſtretching of the Fibres there muſt needs enſue moſt violent Pains, which threaten Convulſions; in this Caſe, I ſay, *Hippocrates* adviſes us to endevour the Reduction of the Two fractured Extremities of the Bone as much as poſſibly we can, and then to put certain Pieces of thin Iron Plates betwixt theſe Ends of the broken Bone, in the Nature of Wedges, by which Means, ſays he, we may make a ſtronger Extenſion in the Bone than in the Muſcles, and ſo accompliſh their Reduction without offering any great Violence to the Muſcles by their too violent Extenſion.

Of LUXATIONS. *Taken out of* Fabricius ab Aquapendente, *his* Chirurgia Univerſalis, Lib. V.

CHAP. I.

Of the Definition, Differences, Cauſes, and Signs of Luxations in General.

WE call that a Luxation or Diſlocation, when the Head of a Joint ſlips or falls out of its proper Cavity or Place into another.

For every Articulation that is deſigned for Motion, conſiſts of the Head of a Bone, and a *Sinus* or Cavity.

As to the Heads of the Bones, it is to be obſerved, that thoſe that have very round Heads, are adapted to all Sorts of Motions, as in the *Femur*, the *Humerus*.

As to the *Sinus* or Cavity, that ſuch Bones as have very deep Cavities, as the *Os Coxendicis*, are not very ſubject to Luxations; but the contrary is obſerved in thoſe that have only a flat Cavity, as in the *Scapula*.

That theſe Heads might be the better retained, and kept from ſlipping out of their Cavities, they are provided alſo with certain Ligaments, ſome of which are orbicular, which incircle the Heads and Cavities in all the Joints; others are round, and are placed in thoſe Joints only which are deſigned for ſtrong Motions, as in that of the

Os

Os Femoris, in the Knee: Theſe ariſe from a deep Cavity, and are inſerted into the Head.

Thoſe Joints therefore that are provided with both theſe Sorts of Ligaments, and thoſe alſo that have only the orbicular Ligament, but ſo as to be cloſely incircled by it, are not very ſubject to Luxations.

There is beſides theſe a certain unctuous and viſcous Humour lodged within the Joints, which prevents the Bones being dried up and over-heated in their continual Motions.

There are Three Sorts of Luxations; the *Firſt* is, when there is an Opening or Separation betwixt Bones that were joined together before, which may happen in Three Places, *viz.* when the broad Bone of the *Scapula* recedes from the *Os Humeri*, the *Radius* from the *Cubitus*, and the *Perone* from the *Tibia*.

The *Second* Sort is, when there happens an Elongation of the Bones, occaſioned by a Softneſs, Relaxation, and Diſtenſion of the Ligaments; ſo that though the Head of the Bone be a little removed out of its Cavity, it is nevertheleſs not quite diſlocated, and may eaſily ſuffer a Diſlocation. This Kind of Luxation I have often taken Notice of in Beggars, in the *Cubitus* and the *Carpus*.

The *Third* Sort is what is properly call'd a Luxation, to wit, when the Head of a Bone ſlips or falls out of its proper Cavity; and in this Sort of Luxation there is no other Difference but what is taken from its Degrees.

If therefore the Head of a Bone is fully and wholly forced or fallen out of its Cavity, it is call'd a Diſlocation; but if only in Part, it is call'd a Diſtortion.

The Joints of the Cubit, of the Hands, Leg, Foot, and Fingers, are ſubject to both Sorts of theſe Luxations; but the compleat Luxation alone belongs only to the *Os Femoris* and the *Humerus*. This is owing to the Rotundity of their Heads, and the Slenderneſs of the Bones of their Cavities: Whence it is, that their Heads at once touch upon theſe Edges or Brows, and ſo ſlip out either all at once, or elſe fall back again into the Cavity: Though *Hippocrates* tells us, that there are alſo Degrees of Luxations in the *Femur* and *Humerus*.

This compleat Sort of Luxation may happen Four different Ways, to wit, either upwards or downwards, or elſe to the Right and Left; unto which *Galen* adds alſo backwards or forwards: But a Bone cannot ſuffer a Diſlocation either forwards or backwards, becauſe on the hind Part there is a Bone that is immoveable, upon which the Member does reſt, and which reſiſts the Compreſſion of the Bone whilſt it is moving; and on the fore Part there is alſo a Bone fix'd, upon which the Member moves.

One Sort of Luxations proceeds only from internal Cauſes, *viz.* from ſuch Humours as induce an Emollition and Relaxation in the Ligaments; but the other Two, to wit, the compleat and incompleat Luxations, may ariſe either from internal Cauſes, *viz.* from the Influx of Humours upon the Joints, which by Degrees fill up the Cavities, and ſo thruſt the Head of the Bone out of its Seat, or elſe from *external*, when the Bone ſuffers a Diſlocation by ſome external Force or Violence, as by Leaping, Falling, Over-running, *&c.* Theſe Luxations ariſing from an external Cauſe, are to be the Subject of our preſent Diſcourſe.

There are various Signs by which we may diſcover the Luxations of the Joints.

Firſt, if the Joints loſe their Motions, for unleſs the Motions of the Joint do ceaſe, there is no actual Luxation, though there may be a Suſpicion of One: But this Sign is not ſufficient alone; and therefore,

The *Second* Sign is, a certain Hollowneſs or Cavity in a Place where there was none before; and on the contrary, a Prominency on the oppoſite Part: For there is always a Tumour on that Side where the Bone thruſt out, and a Cavity in that Part from whence it is receded. This Sign is beſt diſcovered by the Sight and Touch, and beſt of all in thoſe Joints which are naturally not much covered with Fleſh, or elſe in lean Bodies.

The *Third* Sign is, when the Member becomes ſhorter; for the diſlocated Bone having nothing that reſiſts it, is drawn upwards by the Muſcles in the compleat Luxation.

The

The *Fourth* Sign is, when the luxated Member does not appear like the ſound, in Figure, Length, or Poſition.

A compleat Luxation may be diſtinguiſh'd from the incompleat by the Degrees of the before-mention'd Signs.

Thus in caſe all the Motions of the Joint are ceaſed, the Member is remarkably ſhorter, as well as the Cavity and Prominency remarkably large, and the Member altogether unlike to the ſound; this is a perfect Luxation: The contrary is to be obſerved in the imperfect.

A certain Sign of the Dehiſcency of the Bones is, when the Member grows conſiderably thicker beyond its natural State, and a more than ordinary Protuberancy in that Part where the Heads of the Bones are lodged.

That Sort of Luxation wherein the Member becomes longer by the Relaxation of the Ligaments, may be diſcovered,

Firſt, becauſe the Joints appears as if it were faſten'd only by a String, and admits every Way of all inordinate Motions; for by the Relaxation of the Ligaments, the Bones are ſeparated at ſuch a Diſtance, that they do not touch one another.

Secondly, if you preſs upon the Head of the Bone, the Member will return to its natural Poſition; but ſo ſoon as you remove your Finger, it falls as Chance directs it.

Thirdly, there is a Cavity on all Sides about the Joint, which ſometimes is ſo deep, that you may lay your Finger in it. The Signs of a good Reduction of the Bone into its natural Cavity are contrary to the before-mentioned; for when the Member appears again in its natural Station, the Signs diſappear, together with the Cauſes of Luxations.

Avicenna has obſerved another peculiar Sign of a true Reduction of the luxated Bone, to wit, a cracking Noiſe, which he ſays may be heard by the Patient and Standers by, when the Bone is ſet into its Cavity again. But I do not look upon this as a good Sign at all Times, becauſe it is attended oftentimes with Two very pernicious Conſequences; for this Noiſe does either ariſe from the Colliſion of the Head of the Bone with the Brows of the Cavity, ſo that theſe Edges being thin and cartilaginous, are broken, and thruſt within the Cavity before the Head of the Bone can reach thither, and conſequently prevent the true Reduction of the Bone, the Head of which cannot be turn'd quite round within its Cavity, and ſo the Patient limps afterwards: Or elſe this cracking Noiſe ariſes from thence, becauſe the Head of the Bone is thruſt with Violence againſt the Cavity, which may occaſion an Ulcer, a Putrefaction in the Part, and an Incruſtation in the Cartilages, which being ſeparated from the reſt of the Bone, it will become rough, and render the Motion of the Joint difficult.

CHAP. II.

Of the Cure of Luxations in General.

LUxations are in a moſt peculiar Manner the Objects of Chirurgery, becauſe the Cure of them depends altogether on the Dexterity and manual Operation of the Chirurgeon, Nature having no Share in this Work.

There are Four Intentions in the Cure of Luxations, *viz.* Extenſion, Reduction or Repoſition, Deligation, and Collocation or Poſition. Extenſion is required, becauſe the Muſcles draw the diſlocated Bone, and ſhorten the affected Member, becauſe they have nothing that reſiſts their Force. Deligation is neceſſary alſo to keep the Bone within its proper Place, which elſe would be apt to ſlip out again, by reaſon of the Relaxation of the Ligaments.

Theſe Four Intentions muſt be managed ſo as to preſerve the true Figure of the Member, and to prevent a *Phlegmon*. In the Figure of the Member you muſt ſo order your Matters, that Pain may be prevented; and in the Extenſion you muſt take Care to keep the Muſcles entire on one Side, *i. e.* you muſt take Care not to leave the Head of the Muſcle on the inner Side, and the Tail on the Outſide.

In

In the Deligation and Collocation, you must take Care to put the affected Member in such a Figure or Posture which may be said to be the middle, betwixt its two extreme Motions.

The *Phlegmon* is a Symptom which frequently attends Luxations, arising from the Pain both in and after the Luxation; for the Bone being thrust out into a strange Place, does cause a painful Compression upon the Muscles and the nervous Parts; neither can the Extension, which is absolutely necessary for the Reduction of the Bone, be made without Pain. You must endeavour to prevent a *Phlegmon* in Reference to the affected Part by its convenient Collocation or Position; and in Respect to the whole Body, from whence the Humour is discharged thither by Venæsection, Purgation, a proper Diet, *&c.* Of which in another Place.

The *First* Thing now to be done, is the Extension of the affected Member; as has been mentioned in the Fractures.

The *Second* is the Reposition or Reduction of it. This must be done gently, for fear of a Contusion or Collision of the Head against its Cavity. You must also take Care in your Reduction, to avoid the Circumrotation of the Head of the Bone; lest you break the Bone of its Cavity.

The *Third* is the Deligation of the Member, to prevent its starting out again. In this Deligation you must take Care to preserve the natural Shape or Figure of the Member, and to prevent Inflammation, by pressing out the Humours that are fallen already upon the affected Part, and keeping back those that are like to flow thither.

But before you proceed to the Deligation, you must make Application of such Remedies as are proper to prevent a *Phlegmon*, to wit, Adstringents, which, besides the beforementioned Use, are endowed also with a Vertue to contract the relaxed Ligaments, and to corroborate the Part.

Of this Kind are, *Ceratum Barbarum, Diapalma, de Minio, Oxycroceum, Ceratum Simplex, Ceratum Rosaceum, Unguentum Rosaceum, Vinum Pascа, Vinum Granatorum, Succ. Hypocistidis, Decoct. Cort. Granator. Balaust. Album Ovi.*

You may also make a Composition of *Bol. Armen. Sang. Dracon. Myrtill. Cortic. Granat. pulv. & mist. cum Album Ovi ad Mellis consist.* This you must apply upon Stupes round the luxated Joint.

If there be great Pain, this Indication requires Lenients and unctuous Medicaments, such as are qualified to redress the Relaxation of the Ligaments, and check Inflammation. In this Regard you must proceed thus:

If there be not much Pain, you need not much regard it, but apply only Astringents, without unctuous Remedies; as Stupes, with Whites of Eggs. But in case the Pain is such as challenges your immediate Care, you must first of all anoint the Part with such Oils as are qualified to assuage Pain; but at the same Time have somewhat of an Adstringency in them. Such are, *Ol. Ros. Mertyn. Mastichin.* Then you may apply the beforeprescribed Medicament, or else a Linen Cloth spread with *Ceratum Rosaceum*, over which you may lay the aforesaid Stupes.

In the Beginning you must abstain from Cerotes, because by their Hardness they are apt to cause a Compression, and consequently Inflammation: For which Reason it is, that *Galen* applies Linen Cloths dip'd in some Juice or other, before the Deligation.

This done, place the Member in a middling Figure to prevent Pain, as has been said before. Let its Position be even, soft, and raised somewhat upwards.

After all, you must keep the Member after it is pressed up, without stirring, as much as possibly can be, at least for three or four Days; for then you may open your Bandage, by Reason of the Itching of the Part from the Humours that are detained there; and therefore you must bathe it with warm Water, but let not your Water be too hot, for Fear of relaxing the Ligaments, which in Effect rather want a Contraction, and therefore you may abstain from the Fomentation, unless you are compelled thereunto by the Itching of the Part.

In the Second Dressing, if there be no Pain, you may then apply a Cerote, as in the Winter the *Ceratum Barbarum*, and in the Summer the *Ceratum de Minio, Diapalma, &c.*

About this Time you may also apply the *Plagulæ*, or else the *Ferulæ*, of Leather or thick Paper, to keep the Head of the Bone

the ſteadier. And in the ſame Manner you may proceed till the Member ſeems to be ſufficiently ſtrong. Then you muſt open the Bandage, and foment the Part with *Decoct. Abſinth. Roſar. Chamæm. Muſci albi Quercin,* by Way of Corroboration; and after this you may apply a Cerote for ſome Days, and keep the Member without Bandage, and permit the Patient to go about his ordinary Buſineſs; but with Moderation. Thus much concerning the Cure of recent Luxations in general.

Luxations of an old ſtanding require the ſame Intentions; but that you muſt beforehand treat them with Emollients and Diſcutients to be applied at and about the Joint. For this Purpoſe,

Rs. *Rad. Althææ, Unc.* vj. *Rad. Cacum. afin. Unc.* iij. *Fol. Malvæ, Unc.* ij. *coct. in Aqua, & contuſ. Alde Farin. Funugraci, & Sem. Lin. ana Unc. jſs. Ol. Commun. Unc.* vj. *Axungiæ porcin. Unc.* iv. *decoct. prædict. qſ. miſc. & fiat Emplaſtrum.*

If there be a large and hard *Callus*, you may make uſe of the *Empl. Diachylon ſimpl.* or elſe, *cum Gumm. &c.* After this you muſt come to the Digeſtives. Of this Kind is the *Ceratum, &c. Betonicæ*, in tender Conſtitutions; but in ſtrong Bodies, the *Emplaſtrum Sacrum.* But before you apply theſe Plaiſters, you muſt foment the Part with a *Decoct. Chamæm. Hyſſopi, Betonicæ, Stachad.* boil'd in a ſtrong Wine.

But in caſe the Humours are indurated and in great Quantity, we make (after the Emollients) a Fermentation, or elſe a Fumigation of a Flint or Milſtone; and foment the Part with a Decoct. of *Rad. Cacum. afinin. Althææ, Ivæ. Colocynth.* which by their dry and hot Qualities will diſpel the Matter, and attract it out of the Joints. Hot Baths are alſo proficuous here. You may alſo fumigate the affected Member in the Pits belonging to theſe hot Baths; becauſe the warm Evaporations ariſing from thence are endowed with a peculiar digeſtive Virtue.

All this being done in due Method, you muſt manage them for the reſt as you have been directed in the Cure of the freſh Luxations.

CHAP. III.

Of Luxations in Particular; and firſt of all, of the Luxation of the Maxilla.

IN the Luxation of the Jaw, Maſtication ceaſes, and the Speech is depraved: But it happens rarely, becauſe the Head of the *Maxilla*, which is placed within the Cavity, is every where fenced in by Bones. Beſides that, the *Maxilla* is provided with many ſtrong Muſcles, which keep it in its proper Station. It has alſo two Heads, which are not ſo eaſily diſlocated as if it had but a ſingle one; beſides its Two acute Proceſſes.

The *Maxilla* alſo can't be diſlocated but only one Way, that is towards the anterior Part; and there are very few Cauſes that produce this Luxation.

For the Jaw can't ſuffer a Luxation, unleſs when its acute Proceſs ſtarts out below the *Os Jugale*, and can't ſlip in again; and it can't ſlip downward, without you open your Mouth very wide; and it can't ſlip back again, without an exceſſive Diſtortion of the Mouth.

However, I have frequently met with Luxations in the Jaw; the Reaſon of which may be, the continual Motion of the Jaw when we are chewing and ſpeaking, by which the Muſcles being weakned, give Occaſion to theſe ſudden Luxations.

I know there are ſome Anatomiſts and Chirurgeons of Note, who aſſert, That the *Maxilla* may ſuffer a Luxation alſo towards the poſterior, right, and left Side, but erroneouſly, for behind the Bone is in the Way; on the Right Side the Left Head of the *Maxilla* oppoſes it, and on the Left Side the Right Head; ſo that it is evident, that the *Maxilla* can be diſlocated only to the anterior Part.

In the Luxation of the *Maxilla*, either both its Heads are diſlocated, or elſe but one of them. If

If but one of them, (1.) That Part of the Jaw ſtands out towards the anterior Part. (2.) The Chin ſtands towards the luxated Part. (3.) The Bone is diſtorted towards the oppoſite Side of the luxated Part, and the diſtorted *Maxilla* appears with a Prominency. (4.) The *Dentes Canini* are ſet under the *Inciſivi*. (5.) The acute Proceſs appears with a Prominency in the diſlocated Part. (6.) The Teeth can't be well cloſed.

But in caſe the Jaw has ſuffered a Diſlocation on both Sides, the Signs are:

The whole *Maxilla* falls towards the fore Part, and is not diſtorted but ſtrait. (2.) The Mouth ſtands always open. (3.) The acute Proceſs appears with a Prominency on both Sides. (4.) The lowermoſt Teeth come over the uppermoſt. (5.) The Temporal Muſcles lie deep inwards, and appear hard.

Hippocrates ſays, That unleſs the Repoſition be made immediately, continual Fevers, Inflammations, Pains, Convulſions, vitcous Vomiting, *&c.* will enſue; and the Patient will die about the Tenth Day.

I could never meet with any ſuch Thing, tho' I have many of them under my Hands; but, perhaps, *Hippocrates* may have ſeen ſomething like it, becauſe ſome of the chief Nerves, and conſequently the Brain, were affected.

When you are to reduce the *Maxilla*, you muſt make your Motions contrary to that of the *Maxilla* when it ſuffered the Diſlocation.

Firſt, the *Maxilla* ſtarts out to the anterior Part; therefore you muſt thruſt it backwards. *Secondly*, when you open your Mouth it is drawn downwards, therefore you muſt puſh it upwards. *Thirdly*, the Muſcles pull the acute Proceſs upwards, therefore you muſt draw the *Maxilla* downwards.

If it be diſlocated on one Side only, you muſt move the *Maxilla* to the oppoſite Side. But you muſt always begin with making the utmoſt Extent of its Motions.

And therefore in caſe the *Maxilla* has ſuffered a Luxation on both Sides, the firſt Thing the Chirurgeon has to do, is to draw or extend it downwards, next backwards, and laſtly upwards. But if one Side only is diſlocated, you muſt move the *Maxilla* Side-ways.

To effect this, you muſt put both your Thumbs in the Mouth, and with the reſt take hold on the outſide of the Chin, and then you muſt draw the *Maxilla* downwards, backwards, and upwards. By this Means you may ſoon accompliſh its Reduction.

But you muſt take Care during this Repoſition, that the Head be kept firm and ſteady, either by a Servant, or elſe againſt a Wall, that it may not give Way when the *Maxilla* is thruſt backwards.

After the Reduction, you muſt make an Application to the Heads of the *Maxilla*, *i. e.* to the Temples, of ſuch Remedies as will prevent Inflammation, as the *Ceratum Roſaceum*. But if the Extenſion has been very violent, and conſequently where there is Occaſion for ſtronger Adſtringents, you may apply Stupes dip'd in Whites of Eggs, unto which you may add adſtringent Powders if there be Occaſion. You muſt alſo anoint the Temples, *i. e.* the whole Temporal Muſcle, with *Ol. Roſ. Lumbric. &c.*

The Deligation or Bandage muſt be made thus: Place a Roller or Muffler at the Chin, where there may remain a little Space betwixt, ſo as to detain the Chin on both Sides. Then you muſt ſlit or ſplit your Roller in two on each Side; ſo as that the Ear may be drawn thro' it, and then tie it together on the Crown of the Head. Thus it muſt be kept till the *Maxilla* be fully ſettled, which will be in a Day or two, or in three Days at moſt; during which Time, if you find it neceſſary, the Patient muſt abſtain from Meats, neither muſt you neglect Venæſection, and ſuch other Directions as have been given before in the Cure of Luxations in general.

In my own Practice, I never applied theſe Remedies above one Day to the affected Part; and when the Patient was to feed, I uſed to looſen the Bandage.

CHAP. IV.

Of the Luxation of the Humerus.

THE *Humerus* is a large Bone with a round Head, which is inſerted into the ſuperficial Cavity of the *Scapula*. This Head is incircled by an orbicular Ligament only, which is pretty looſe.

The Cavity is ſurrounded with certain Barriers or Fences, for on the exterior Part the *Scapula* has a pretty large Proceſs, made by the Spine of the *Scapula*. On the ſuperior Part it has partly the ſaid Proceſs, partly the Clavicle, and in the internal Part the *Proceſſus Anchorocides*.

Hence it is evident, that the Head of the *Humerus* may eaſily ſuffer a Luxation, becauſe this Joint is uniform and ſingle, and not double, as in the Knee: Beſides that, the *Head* of the *Humerus* being round, is deſtitute of a long Neck, and is inſerted in a ſuperficial Cavity only; and for that Reaſon it may ſooner be diſlocated than the *Femur*, which has a long Neck, and enters into a deep *Acetabulum*.

Beſides this, here is only a ſingle orbicular Ligament, (but no round One beſides, as in the *Femur*) and is looſe. The Joint of the *Humerus* alſo is not much covered with Fleſh, and upon that Account it is more apt to ſuffer a Luxation than a fleſhy Joint.

The *Humerus* cannot ſuffer a Luxation but one Way, *i. e.* downwards under the Armpit, becauſe here it is not fenced in; as it is every where elſe; beſides that, the *Humerus* is apt to ſlip downwards by its own Weight: However, *Galenus* aſſures us, that he has ſeen no leſs than Five Times a Luxation of the *Humerus* to the anterior Part.

In caſe the *Humerus* is diſlocated downwards under the Armpit, it appears very different in its Figure from the ſound: Beſides, that in the upper Part of the *Humerus* there will appear an unuſual Cavity or Hollowneſs, but under the Armpit a hard round Prominency of the Head may be felt with your Hand.

Thirdly, as long as the *Humerus* remains in its natural Station, the ſuperior Proceſs of the *Scapula* will appear round; but when the *Humerus* is luxated, the ſaid Proceſs appears ſharp-pointed, becauſe the Head, which uſed to form this rotund Prominency, is now ſlipp'd downwards.

Fourthly, the *Cubitus* ſtands at a Diſtance from the Ribs, and cannot be brought near unto them without great Pain.

Fifthly, the Patient cannot bring his Hand to the Head, becauſe the Joint of the *Humerus* cannot move any longer upwards; and the other various Motions of the *Humerus* are impaired alſo.

Sixthly, the diſlocated Arm is longer than the ſound One, in caſe the *Humerus* ſlips only downwards; but it becomes ſhorter, if the Head, after it is fallen downwards, is pull'd upwards by the Muſcles.

Seventhly, the Part lies in Pleats, or is corrugated at the Extremity of the *Axilla*, which in the luxated *Humerus* lie much lower both before and behind than in the ſound Arm, which ſhews that the Head of the *Humerus* is ſlip'd downwards.

In caſe the *Humerus* has ſuffered a Diſlocation to the anterior Part, the Signs are, a Prominency in the anterior Part, and on the hind Part an unuſual Hollowneſs. The Cubit alſo ſtands backward, and there appear no Signs of the luxated *Humerus* under the Armpit.

Hippocrates is of Opinion, that the *Humerus* and the *Femur* are ſubject only to a perfect Luxation; the Reaſon whereof we have given you before, and is undoubtedly true, provided the Luxation owes its Origin to an external Cauſe: But if to internal Cauſes, as to concreted or half-indurated Humours, theſe may induce an imperfect Luxation, becauſe they force the Head of the Bone gradually out of its proper natural Station or Cavity.

Concerning the Cure of the Luxation of the *Humerus*, *Hippocrates* propoſes no leſs than Ten different Ways of its Reduction, which may very conveniently be brought under Three general Heads. *L. 2. de Art.*

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The *Firſt* is made by Way of Circumrotation or Circumvolution, *viz.* when either the Chirurgeon or the Patient put their contracted or double Fiſt under the Armpit; ſo that by the Strength of the middle Knuckles of the Fingers they may thruſt the Head of the *Humerus* back into its Cavity. This Way of Reduction takes Place only in Children, and in ſuch Bodies as have very laxe and moiſt Ligaments: But as this is an eaſie Way of Repoſition, ſo it eaſily ſlips out again. This Method is ſtyled by *Hippocrates*, *not according to Nature*, becauſe whilſt we turn or make the Circumvolution of the Head of the *Humerus* about the Body of the *Scapula*, the membranous and nervous Bodies, as well as the Brows of the Cavity, may eaſily ſuffer an Attrition, which, as it will cauſe an Influx of the Humours upon the luxated Part, ſo it will fruſtrate the Chirurgeon in his Repoſition.

The Second Way of Reduction is performed by a Motion contrary to that when the Bone ſuffered the Diſlocation. When the Head of the *Humerus* is diſlocated, it firſt ſtarts out of its Cavity, and ſo it moves forwards; next it is carried downwards; and laſtly, it is pull'd towards the poſterior Part by the Muſcles.

This Way of Repoſition differs from the Firſt, in that in the Firſt by the Circumrotation the Motion is made by curved Lines, but in the Second by ſtreight Lines. In this Second Way of Reduction therefore you muſt attend alſo to theſe Three Motions, but in a Way contrary to that by which it did ſlip out; (1.) from the poſterior to the anterior Part; (2.) from the anterior to the ſuperior Part; and (3.) backwards.

Firſt of all therefore the Chirurgeon muſt fix his Head againſt the upper Part of the Shoulder of the Patient; after which he muſt put his Fingers under his Arm-pit, and then with his Knee preſs his Elbow. The Patient muſt be in a ſitting Poſture. Now let us ſee how theſe Operations are anſwerable to the ſeveral before-mentioned Indications.

The Firſt Motion that is to be made in the Reduction of the *Os Humeri*, is to be made to the anterior Part: This is effected by the Help of the Fingers, which are put under the Armpit; and this ſame Motion is corroborated and facilitated by the Help of the Knee, which preſſes the Elbow towards the Ribs, which by the Diſlocation was removed at too great a Diſtance from them: For as whilſt the *Humerus* ſlips down into the Armpit, the Cubit is thruſt off from the Ribs; ſo on the other Hand, whilſt the Elbow is preſs'd downwards towards the Ribs, the *Humerus* is moved forward; ſo that by the Help of the Chirurgeon's Fingers, and his Knee, the *Humerus* is moved from the poſterior to the anterior Part.

The Head of the Chirurgeon is fix'd againſt the upper Part of the Shoulder, that whilſt the Fingers are thruſting the *Humerus* forward, the reſt of the Body may not alſo follow of Courſe; or rather (as I have often obſerved in my Practice) that the *Scapula* it ſelf, which is moveable, may not follow alſo: For the Luxation of the Joint of the *Humerus* is not eaſily reduced, unleſs the Luxation be very lately made; for this Reaſon only, becauſe whilſt the Extenſion is made, the *Humerus* does not ſtir out of its preternatural Place, but it is rather the *Scapula* that is moved.

This is the Firſt Motion, as directed by *Hippocrates*, *i. e.* the Motion of the *Humerus* toward the anterior Part; but makes no Mention of the other Two, becauſe they are accompliſhed by the Muſcles; for theſe, if they are entire, and the Luxation be freſh, draw the *Humerus* upwards, and reduce it into its natural Poſition, ſo ſoon as the Head of the *Humerus* is at Liberty, and not detained, as it was before, backwards under the Armpit.

This Second Way may be accompliſhed alſo by another Method; for becauſe we cannot ſo eaſily and conveniently thruſt the Elbow towards the Ribs with our Knee, we may inſtead of the Knee make Uſe of a Servant, who with his Hands may thruſt the Cubit toward the Ribs.

There is alſo a Third Method for the accompliſhing of this Second Way of Repoſition. Let the Cubit be brought backwards to the Spine, by which Means the *Humerus* will be thruſt towards the anterior Part; then with the other Hand take Hold of the Elbow, and make a Motion towards the ſuperior Parts, and let the other Hand be

be fixed to the upper Part of the Shoulder, to prevent the Motion of the *Scapula*; as has been ſaid before.

The Third general Way of Reduction of the *Humerus* ſuperadds the Extenſion to the Second, which is abſolutely neceſſary, if ſo it happens, that the Head of the *Humerus* has been ſtrongly fixed in a preternatural Place or Station. Add unto this, that the Muſcles are always pulling it upwards, which conſequently gives us this Indication of drawing it downwards by Extenſion.

This Extenſion is made either without or elſe with Inſtruments.

Without the Help of Inſtruments, it is accompliſhed Two different Ways:

The Firſt is, when the Patient is placed in a cumbent Poſture, and the Chirurgeon being ſeated upon the ſame Plan, takes Hold with both his Hands of the luxated Arm, and fixes his Foot under the Armpit. (He muſt make Uſe of his Right Foot, if it be the Right *Humerus* that is luxated, and of the Left if it be the Left.) But before he puts the Heel of his Foot under the Armpit, 'tis requiſite he ſhould put a hard Tennis-Ball under it. This done, his Servant muſt take Hold of the oppoſite Arm, and pull it downwards, whilſt another Perſon with a Roller or Piece of Leather, or ſtrong Bridle, of ſuch a Breadth as to cover the Ball, draws both the Heads upwards towards the Head of the Patient, and afterwards fix his other Foot upon the upper Part of the luxated *Humerus*.

Now let us ſee how the Reduction of the *Humerus* is accompliſhed by theſe Operations.

The Firſt who pulls the Arm downwards, and the other who pulls the Roller or Bridle upwards, make an Extenſion and Motion downwards. The Motion towards the anterior Parts, is effected both by Means of the Ball and of the Heel: For which Reaſon it is, that the Heel muſt be fix'd exactly betwixt the Ribs and the Head of the *Humerus*, or the Ball, in order to thruſt the Head of the *Humerus* forward. The Ball is applied here for no other Purpoſe than to fill up the Cavity of the Armpit, which is form'd by the Tendons and Muſcles, that have their Situation on both Sides, and into which the Heel cannot be fix'd, nor conſequently exert its Operation, but by the Help and Intervention of the Ball.

The Firſt Chirurgeon therefore takes Care of Two Motions, to wit, downwards and forwards; the Second, or the Servant, which pulls the Bridle or Roller upwards, makes a Motion upwards; and by his Preſſure with his Foot upon the upper Part of the *Humerus*, prevents the *Scapula* from following it. The Third Perſon, who draws the ſound *Humerus* downwards, takes Care that the whole Body may not follow the Extenſion of the *Humerus*.

The Second Method of Extenſion without an Inſtrument is thus: Let a ſtrong-bodied Man, who muſt be higher of Stature than the Patient, take the Armpit of the ſick Perſon over his Shoulder, ſo as to lift him from the Ground, and thus make an Extenſion, and then let him bring the luxated Arm to his Breaſt, ſo that the *Humerus* may be moved to the anterior Part. Then another Perſon ſtanding behind the Patient muſt with hrs Hands pull his Neck and upper Part of the *Humerus*, to prevent the *Scapula* from following it: And laſt of all, let a Boy hang on the Sides backwards, ſo that he may not touch the Ground with his Feet, and by ſo doing prevent the whole Body from following the ſame Motion.

Theſe are the Two Ways of Extenſion without Inſtruments. Now let us proceed to thoſe alſo which are performed by the Help of Inſtruments; and among theſe Inſtruments, ſome are fixed only under the Armpit, and others are applied in Conjunction with a Table.

Thoſe that are placed only under the Armpit are, the *Piſtillus*, and the Ladder.

The *Piſtillus*, (or for Want of ſuch a one, a Stick) muſt be covered with a Piece of Cloth, leſt being ſmooth it ſhould be apt to ſlip out: Then fix one of the Extremities of this Stick under the Armpit, and the other to the Ground: (If the Stick is long, the Patient may be kept in a ſtanding Poſture, but if it be ſhort, he may ſit.) Then One of the Servants muſt pull the Arm downwards, whilſt another ſtanding behind does likewiſe draw, or rather preſs, the upper Part of the *Humerus* and the Neck. You muſt take Care alſo to keep the ſound *Humerus* firm and ſteady.

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In this Operation there is, firſt, a Motion downwards, next forwards, by the Stick that is placed near the Ribs. Concerning the other Motions, we have had Occaſion to ſpeak before.

But conſidering that the Application of the Stick is ſomewhat uncertain, becauſe thereby the whole Body may be turn'd about; for this Reaſon it is, that the Ladder is moſt in Uſe. This Ladder muſt have one Step, which muſt be round in the Middle, ſo that it may be placed conveniently under the Armpit, betwixt the Head of the luxated *Humerus* and the Ribs: Then the Chirurgeon muſt pull the diſlocated Arm downwards, whilſt one of his Servants takes Hold of and pulls the Neck and upper Part of the *Humerus* on the other Side, and a Third pulls the whole Body downwards on the other Side of the Ladder.

But if you are to make Uſe of the Inſtruments with a Board, you muſt proceed thus:

Let a Board be made ſomewhat ſhorter than Two Cubits in Length, *i. e.* of the ſame Length as the whole Arm is, and of the Breadth of about Four or Five Inches, leſs or more, according to the Thickneſs of the Patient's Arm. Let its Thickneſs be of Two Inches, or ſomewhat leſs. The Extremity of this Board ſhould be narrower, and ſomewhat thinner, with a ſmall round Head or Prominency, and a ſlender Cavity within it, for the Reception of ſome Part of the Head of the *Humerus*.

This Extremity with the ſmall Head is to be placed under the Armpit of the luxated *Humerus*, betwixt the Ribs and the Head of the *Humerus*; and the remaining Part of the Board being placed all along to the Inſide of the Arm, muſt be tied firſt immediately underneath the Head of the diſlocated *Humerus*, next below the Elbow, and then at the Wriſt.

This Board being thus tied to the Arm, we perform the Repoſition of the *Humerus* by the Help of Three other different Inſtruments.

The *Firſt* Inſtrument is made out of Two round Pieces of Wood, and another tranſverſe, tied to theſe Pieces. This tranſverſe Piece of Wood muſt not be round, but of the ſame Figure with the Board, but larger, becauſe it is to ſuſtain the Weight of the whole Body. To this tranſverſe Piece of Wood you muſt tie the diſlocated *Humerus*, ſo that this Piece of Wood may lie betwixt the Ribs and the Board that is tied, and this you muſt faſten to the foreſaid round Pieces of Wood, to ſuch a Height, that the Patient can ſcarce touch the Ground with the Tips of his Toes. The Patient being thus diſpoſed, the Chirurgeon muſt pull the Arm downwards on one Side, whilſt his Servant taking Hold of the Patient's Neck, and upper Part of the Shoulder, does likewiſe pull downwards.

Whilſt the Chirurgeons are drawing the Arm downwards, the Board is, together with the Arm, drawn at the ſame Time towards the Ribs; and whilſt the inferior End of the Board is brought towards the Ribs, the upper round Extremity makes a contrary Motion; and thus the diſlocated Head is moved to the anterior Part; which Motion being once made, the Muſcles themſelves will afterwards draw it without much Difficulty, or by the Impulſion of the Chirurgeon encompaſs the Repoſition of the Head of the Bone.

The *Second* Inſtrument is known by the Name of the *Italian* Bench. This muſt have a plain Back, and over this Back the Arm muſt be ſtretch'd with the Board faſten'd to it; and for the reſt, the Repoſition is perform'd in the ſame Manner as has been ſhewn before, with the tranſverſe Piece of Timber or Wood.

The *Third* Inſtrument is a Door, over which the Arm is ſtretch'd, with the Table tied to it, in the ſame Manner as in the *Theſſalian Seat* or *Bench*.

If the *Humerus* has ſuffered a Luxation towards the anterior Part, and the Reduction is to be made, you muſt make a contrary Motion; and notwithſtanding the Member is not ſhorter, yet an Extenſion muſt be made, but moderately.

Take this for a general Rule; That when the *Humerus* is but lately diſlocated, it may be reduced only with your Fingers: But if this Luxation be of a long Standing, it meets with no ſmall Difficulty in its Reduction, becauſe the *Humerus* is lodged very firmly, and has contracted in ſome Meaſure a *Callus*: Beſides that, the Cavity is fill'd

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up with Fleſh, which forces the Bone out of its proper Seat, even after its Repoſition.

After the *Humerus* is reduced, you muſt fortify it by convenient Deligations.

But before you proceed to the Deligation, you muſt apply ſuch Remedies as are qualified to prevent a *Phlegmon*, and at the ſame Time contract and conjoin the relaxed and diſtorted Ligaments, ſuch are thoſe as have been mentioned before; *Bol. Arm. Sang. Drac. Myrtilli, Balauſtia Pulver.* beaten up with the Whites of Eggs to the Conſiſtency of a Honey, and apply them with Stupes or Linen Cloths, made up like a Ball, which may be applied underneath the Armpit, to prevent the *Humerus* from ſlipping down again by Reaſon of its own Weight, and the Relaxation of the Ligaments: After which you muſt apply a broad Piece of Linen Cloth, preſs'd out of Red Auſtere Wine.

Laſtly, you muſt apply your Rollers or Bandages, which muſt be ſo contrived, as to keep the Ball ſtreight, and either draw or at leaſt keep the Arm upwards.

Therefore put the Middle of your Roller about the Ball, and then wind it round about the Joint once or twice, and then let both the Heads be ſtretched to the Neck of the other Side.

After Three or Four Days you may open your Bandage; and if you find there is ſtill ſome Fear of an Inflammation, or that the Ligaments are not ſufficiently contracted, you muſt reiterate the Application of the beforeſaid Remedies, until there be no more Fear of an Inflammation, or till the Ligaments are ſufficiently ſtrengthen'd. Then there is no more Occaſion for Bandage nor Medicaments, unleſs it be ſome Cerote, which in the Winter-time may be the *Ceratum Barbarum*, but in the Summer Seaſon the *Diapalma.*

CHAP. V.

Of the Luxation of the Elbow.

THE Joint of the Elbow, as it is very hard to be diſlocated, ſo it is very difficult to be reduced; (1.) Becauſe it is not round; and, (2.) Becauſe the Bones that compoſe this Joint do actually receive and are received by a *Ginglymus:* (3.) Becauſe the Ligaments of this Joint are very ſtreight; and, (4) Becauſe here are not only Two Bones, as it is in moſt Joints, but Three, to wit, the *Humerus, Cubitus*, and *Radius*, which are entangled and conjoin'd one with another by membranous Ligaments.

Unleſs the Repoſition of the luxated Elbow be made ſpeedily, moſt violent Pains will enſue, becauſe its large Head cauſes a Compreſſion upon the circumjacent Muſcles, and upon the Nerves that run down to the Hand. Its high and ſharp-edged Brows do alſo cauſe a Punction in thoſe Parts: Beſides that, the *Radius* adds to the Pain; for if it be luxated alſo, it cauſes more Compreſſions; but if not, it cauſes various Diſtentions of the nervous Parts; and the Conſequences of this Pain are, a Fever, bileous Vomitings, *&c.*

The *Cubitus* may ſuffer a Luxation either forwards or backwards, either outwards or inwards; and the *Radius* does either undergo the ſame Diſlocation, or elſe keeps in his Station.

If the *Radius* does follow, you may feel the Interſtice betwixt the *Radius* and the *Cubitus.* If the *Cubitus* is diſlocated forward, theſe are the Signs by which you may diſcover it: You cannot bend the Elbow outwards; the *Cubitus* will be ſhorter; there is an unuſual Tumour in the anterior Part, and an unuſual Hollowneſs in the poſterior; the Motions of the Cubit are impaired.

If the Luxation be made backwards, the Signs are the ſame, only that the Tumour appears in the poſterior, and the Hollowneſs in the anterior Part.

If this Luxation be made outwards, the Signs are alſo the ſame, but the Tumour is outward, and the Hollowneſs inward; and the contrary is to be obſerved in caſe the Luxation be made toward the interior Part.

The *Cubitus*, when it has ſuffered a Luxation, muſt be reduced ſo ſoon as poſſible, may

may be; for unleſs you do ſo, there will ariſe great Inflammation, which is occaſion'd by the exceſſive Pain, and then the luxated *Cubitus* will ſoon contract a *Callus*, becauſe the Joint of the Elbow is not covered with Fleſh, is nervous, and of a cold Conſtitution; and if a *Callus* be once generated, the *Cubitus* is paſt Repoſition, unleſs you are able to mollify it by the beforemention'd Remedies.

If therefore the *Cubitus* be luxated forward, you muſt firſt of all make an Extenſion in a congruous Poſition, not directly but obliquely, leſt the Head of the *Humerus* ſhould touch upon the high-raiſed Brow or Edge of the *Cubitus*, and break it in its Circumrotation. This done, the luxated *Cubitus* may be reduced by Four different Ways:

Firſt, if it be an imperfect Luxation, it may be reduced only by a ſudden Flexion of the Elbow.

Secondly, in a perfect Luxation there muſt be an Extenſion; and you muſt apply ſome hard and round Body, made of Linen Cloths folded together, to the Flexure of the *Cubitus*, and then make a Flexion of the Elbow. The Extenſion muſt be made by Two Servants, one of which muſt pull the *Humerus* upwards, and the other the *Cubitus* downwards, but obliquely. That round Body which is applied to the Flexure of the *Cubitus*, muſt be preſs'd upon it, that ſo, when the Flexure is made, the Repoſition may be effected.

Thirdly, Two Servants may both together make an Extenſion; and a Bridle or Roller muſt be applied to the luxated *Cubitus*, which muſt be of ſuch a Length, that the Chirurgeon may put his Foot into it like into a Stirrop. Whilſt the Extenſion is making, and the Bridle pull'd downwards by the Chirurgeon's Foot, the Chirurgeon muſt put his Hands to the Elbow, and thruſting it backwards, make a Flexion, and thus reduce the Bone.

Fourthly, a compleat Luxation of this Joint may be reſtored alſo by the Aſſiſtance of the Hands only; for by making an Extenſion, and taking Hold both of the *Humerus* and *Cubitus* at each End, the Joint of the Elbow may by a ſudden Flexion be reduced into its proper Station.

In caſe this Luxation be made towards the poſterior Part, you muſt make an oblique Extenſion, and ſo this Diſlocation, if it be newly made, is reduced without much Difficulty: And becauſe the Extenſion in this Caſe is ſomewhat difficult, by Reaſon of the *Muſculi Extenſores Cubiti*, which are very ſtrong on the exterior Part, the Chirurgeon ought to beſmear his Hands with Oil, thereby to render theſe Muſcles the more pliable.

But if it ſhould happen ſo, that this Diſlocation would not admit of a Reduction barely by the Chirurgeon's Hand, you muſt then have Recourſe to Inſtruments, *viz.* the Ladder, or *Hippocrates's* Bench, *&c.*

In caſe the Elbow is diſlocated to the interior Part, or to the exterior, you muſt make Extenſion, and thruſt in toward the oppoſite Part.

After Reduction made, you muſt apply ſuch Medicaments as may aſſwage Pain, contract and reſtore the relaxed and diſtorted Ligaments to their natural Tone, and prevent Inflammation: The Firſt End is anſwered by oleaginous Remedies, and the reſt by Adſtringents. Your Buſineſs is to judge which of them is moſt urgent.

If there be Pain, you muſt mix *Ol. Roſac. aut Myrtinum*, with adſtringent Powders and Whites of Eggs; or elſe you may make Uſe of the *Ceratum Roſaceum*, ſpread upon a broad Piece of Linen Cloth, and after that apply Stupes covered with a Compoſition made of the adſtringent Powders, beaten up with Whites of Eggs.

Laſt of all, you muſt take Care of a convenient Deligation, like unto thoſe preſcribed before in the Fractures; but always take Care to keep the Member in a middle Figure.

CHAP. VI.

Of the Luxation of the Radius.

THE *Radius* uſed to ſuffer a Luxation chiefly towards the exterior Part. The Signs are: There appears a Tumour on the exterior Part; the *Cubitus* and *Radius* ſtand at a Diſtance one from another. It is ſoon reduced inwards by Extenſion.

CAHP. VII.

Of the Luxation of the Wriſt or Hand, the Metacarpus, *and the Fingers.*

THE *Carpus*, taken all together, which is articulated with the *Cubitus* by *Diarthroſis*, may ſuffer a Diſlocation either inwards or outwards, either forwards or backwards; but chiefly to the anterior Part; and then the Signs are, a Tumour in the anterior Part, and the Fingers will not bend. If the Luxation is made toward the back Part, the Fingers cannot be extended, becauſe the Tendons and Nerves ſuffer a Compreſſion by the Bones. If the Luxation is made either outward or inward, there appears a Tumour on that Side, and a Hollowneſs on the oppoſite Part.

If therefore the Luxation be made towards the anterior or the poſterior Part, let the Hand be laid upon a Table or Board, upon the Back if it be forward, and upon the Flat or Inſide if backwards; then let Extenſion be made by Two Servants, one of which muſt pull the Fingers at one End, and the other the Arm at the other End.

Whilſt this Extenſion is making, the Chirurgeon muſt thruſt the diſlocated Joint to the oppoſite Side or Part, by preſſing upon it with his Hand, or elſe with his Heel in ſtrong Bodies. *Celſus* adviſes us to apply ſomething that is hard, made of Linen, upon the luxated Joint, on that Part where this Preſſure is chiefly to be made; by which Means, he ſays, the Intruſion will be more forcible, and leſs painful. If the Luxation is made either outwards or inwards, the Chirurgeon muſt, whilſt the Extenſion is making, make his Intruſion toward the oppoſite Side.

The Luxations of the Bones of the *Carpus* and of the *Metacarpus* are reduced without much Difficulty, in the firſt, without any, and in the latter, with a very moderate Extenſion, by placing the Hand upon a Table, and placing ſomething that is hard underneath; which done, the Chirurgeon may either with his Hand or with his Heels thruſt theſe Bones either forwards or backwards, as Occaſion ſhall offer, according to the Operation that is to be made.

The Fingers do ſuffer alſo their Luxations to the anterior and poſterior, as likewiſe to the lateral Parts.

In theſe Luxations the Signs are very apparent to the Eye, becauſe the Joints here are not at all covered with Fleſh.

In the Reduction you muſt lay the Hand upon a Table or Piece of Board, and by making an Extenſion with the Aſſiſtance of Two Servants, the Bone may without much Difficulty be intruded to the oppoſite Side.

After the Reduction is accompliſhed, you muſt apply proper Medicaments, make a good Bandage, and give ſuch a Poſition to the Member, as may be beſt ſuitable to its preſent Circumſtances, *&c.*

CHAP. VIII.

Of the Luxation of the Femur.

THE *Os Femoris*, or Thigh-Bone, has a very round Head, which being conjoin'd to a long Neck, is inſerted into a very deep Cavity. The *Femur* and its Cavity are tied to the *Os Coxendicis* by Two Ligaments, to wit, one orbicular, and the other round.

round. Thence it is, that the *Femur* cannot be ſubject to an imperfect Luxation, but only to a perfect One, and conſequently muſt ariſe from an external Cauſe; as we told you before concerning the Luxation of the *Humerus*.

The *Femur* will ſuffer a Diſlocation toward the anterior, the poſterior, exterior, and interior Part; but not without a great deal of Difficulty: *Firſt*, by reaſon of its ſtrong Muſcles, and the great Quantity of the muſculous Fleſh: *Secondly*, by reaſon of the Depth of the *Acetabulum*: *Thirdly*, by reaſon of its Two ſtreight and ſhort Ligaments.

But above all, it happens very ſeldom that the *Femur* ſuffers a Luxation to the anterior and poſterior Part, becauſe here the *Acetabulum* has its Brow much higher; but more frequently outwards, becauſe here it is not ſo high; and moſt frequently of all inwards, becauſe here it is but low: Unto this you may add alſo the round Ligaments, which lying neareſt to the interior Part, and therefore is moſt diſpoſed to let the *Femur* ſtart out to the Inſide.

In caſe the *Femur* has ſuffered a Diſlocation inwards, it appears to be longer than the other, becauſe the Head of the *Femur* ſtands lower. The Knee ſtands outwards, and ſo does the Leg and the Foot; for at all Times when one Extremity ſlips out of Joint, the oppoſite Extremity inclines to the oppoſite Side. Whence it is, that when the Head of the *Femur* is disjointed inwards, the Knee, the Foot, and the Leg, turn outwards: Beſides this, the Thigh cannot be turn'd inwards towards the Groin, becauſe the Muſcles call'd Flexors are ſtreighten'd, and prevented from lifting up and bending the *Femur*.

The Second Sign is, there appears a manifeſt Tumour about that Part which is betwixt the *Anus* and the Teſticles, on the exterior Part of the Cavity.

But in caſe the *Femur* be luxated outwards, the Signs are contrary to thoſe beforementioned; for the Leg is ſhorter than the other, becauſe the Head ariſes above the Cavity. In that Part betwixt the *Anus* and the *Scrotum* you may perceive a Hollowneſs, but is ſwell'd towards the Buttocks: The Knee, the Leg, and the Foot turn inward: The Patient can draw his Thigh upwards, becauſe the Muſcles call'd Flexors are not impaired in their Motion. His Heel will not reach to the Ground, but only the lower Part of the Sole of the Foot, becauſe the Thigh is become ſhorter.

If the Luxation of the *Femur* be made forward, the Thigh, when extended, cannot be bent again, becauſe the Muſcles Flexors are impaired in their Functions, and ſuffer a Compreſſion from the Head of the *Femur*. They labour alſo under a Suppreſſion of Urine, becauſe the Head of the *Femur* preſſes upon the Bladder. There is a Swelling in the Groin, becauſe the Head of the *Femur* is ſlipp'd that Way. The Buttocks are corrugated, and appear lean, becauſe the whole *Os Femoris*, together with its Proceſſes, is thruſt forward.

In caſe the *Femur* be disjointed backward, all the Signs are contrary to the former. The Thigh will not admit of an Extenſion, becauſe the Muſcles call'd Extenſors, which are ſituated on the poſterior Part, ſuffer a Compreſſion, and for that Reaſon cannot be pull'd to their own Origination: The affected Thigh is ſhorter than the ſound, becauſe the Cavity ſtands below and the Head above it: The Feet touch the Ground with the Heel; the Groins appear flaccid; and the Head of the *Os Femoris* ſtands out backwards at the Buttocks.

The Reduction of the *Os Femoris* after it is luxated is very difficult, becauſe Extenſion cannot be made, by Reaſon of the ſtrong Muſcles; but this Repoſition proves much more difficult, in caſe this Luxation be of an old Date, has contracted a *Callus*, and the Humours fall upon the Head of the *Femur*, and fill up the Cavity.

The *Os Femoris* is alſo very apt to ſtart out again after its Repoſition, becauſe the Muſcles being much weaken'd, they want ſufficient Strength to keep ſo ponderous a Body as the *Femur* is in its proper Station, eſpecially if the round Ligament happens to be either relaxed or broken aſunder.

The Reduction of the *Femur* may be made either without or elſe with an Extenſion. Without Extenſion, it is done Two ſeveral Ways; but theſe will take Place on-

ly in very neat Luxations, and when this Diſlocation is not made far beyond its proper Poſition, and that in infant Bodies.

The *Firſt* Method is, to turn or make a Circumrotation of the Head of the *Femur* about the Cavity, (as has been mentioned before in the Luxation of the Arm) and keep cloſe to it till it ſlips again into its proper Cavity. But this Method is not very ſecure or ſafe, it being not without Reaſon to be feared, that the Head of the *Femur* rubbing or hitting againſt the Brow of the Cavity, may either turn it inward or break it.

The *Second* Way is performed by a ſudden *Flexion* of the *Os Femoris*, which ſometimes makes the Head ſlip again into its natural Situation or Cavity.

The beſt Way of reducing the *Os Femoris* is made by Extenſion.

In caſe therefore the *Femur* has ſuffered a Diſlocation inward, though it ſeems as if there were no Need for Extenſion, becauſe the Thigh is longer than it ſhould be, (not ſhorter, as it happens in other Luxations, in which the Muſcles that move the Head of the Bone have their Originations far above it, and therefore pull the Head upwards) nevertheleſs there will be a moderate Extenſion required, *i. e.* ſo much of it as is neceſſary to remove and diſintangle the Head from the Place where it is ſettled.

This may be accompliſhed by the Help of your Hands only, if the Luxation be new, if moderate, and in a young or rather infant Body; and muſt be managed thus:

Let one of the Servants take Hold of the Patient under the Armpits, and thus keep him firm, whilſt another Servant with both Hands takes Hold of him above the Knee, and makes the Extenſion; and whilſt this is a doing, the Chirurgeon muſt preſs the *Os Femoris* that ſtarted out inwards with his Hands outwards, and the Head of the Bone being eſcared by the Extenſion, will, by the Help of the Impulſion, and the Muſcles that draw it upwards, ſoon be reduced into its natural Poſition; or elſe if the Muſcles happen to be much weaken'd, the Chirurgeon may perform this Part without much Difficulty.

But if this Luxation happens in a robuſt Body, and of a more advanced Age, there is much greater Extenſion required, and muſt be accompliſhed by the Help of Ropes or Bridles. The Bridle therefore muſt be adapted to that Part or Space which is ſituated betwixt the *Anus* and the genital Parts; and you muſt ſo place your Bridle, that it may not come over the Head of the Bone: After this you muſt tie or faſten another Bridle above the Knee, and another perhaps above the *Talus*; then pull theſe Bridles at both their Heads or Ends, either with your Hands, or elſe by the Help of the Ladder, to one Step of which you muſt tie the uppermoſt Bridle, and place the Patient upon the Ladder, whilſt the other Bridle is pulling downwards. You may alſo make Uſe for the ſame Purpoſe of *Hippocrates's* Bench.

However, theſe violent Extenſions ought rather to be made Uſe of in the other Luxations of the *Os Femoris*, when it is diſlocated to the exterior, or anterior, or poſterior Part; for then, whilſt this Extenſion is made, the Chirurgeon may eaſily accompliſh its Repoſition, by thruſting its Head to the oppoſite Part.

After the Reduction of the Head of the *Os Femoris* into its natural Station, you muſt make Applications of ſuch Medicaments as will prevent a *Phlegmon*, aſſwage Pain, and contract and corroborate the relaxed Ligaments.

CHAP. IX.

Of the Luxation of the Knee.

THE Knee is not very ſubject to Luxations, becauſe it has Two Ligaments. It has alſo a Head and a double Cavity. It ſuffers nevertheleſs both a perfect and an imperfect Diſlocation, and will be luxated outwards, inwards, and backwards. *Celſus* is the only Author who adds unto theſe the Fourth, *i. e.* forward; but this Luxation happens

happens very ſeldom to the Knee, by reaſon of the Knee-pan, which being tied and kept in its Poſition by very ſtrong Ligaments, ſerves for a ſtrong Barrier or Fence to the Knee on its fore Part; ſo that it can't well be diſlocated, unleſs it muſt be by ſome extraordinary Force or Violence.

Theſe ſeveral Sorts of Luxations are eaſily diſcernable by the Eye; eſpecially ſince this Part is not covered with any Fleſh; for you may diſcover a Tumour in a Place where there uſed to be none, and a Hollowneſs on the oppoſite Part. You will ſee the Figure of the Knee depraved, and its Motions debilitated, or quite loſt.

If it be an imperfect Luxation, there is none, or at leaſt a ſmall Extenſion required, but only an Intruſion to the contrary Part. But if it be a perfect Diſlocation, Extenſion will be abſolutely neceſſary; which in infant Bodies, and freſh Luxations, may be encompaſſed by the Help of the Hands; letting one of the Servants pull at the upper Part, and another below the Knee, near the Foot; and in the mean while the Chirurgeon muſt thruſt the diſlocated Bone toward the oppoſite Side.

But in great Luxations, and in Bodies of a more advanced Age, you muſt have Recourſe to the Bridles, or perhaps to Engines; ſuch eſpecially as are adapted to pull upwards, and by this Means to make a ſufficient Extenſion.

CHAP. X.

Of the Luxation of the Talus, *or the Joint of the Foot, and of the Toes.*

THis Joint may ſuffer a Diſlocation towards the interior, exterior, anterior, and poſterior Part.

If to the interior Part, the undermoſt Part of the Foot is turned outwards; and if to the exterior Part, the contrary does happen.

If this Luxation happens to be made towards the anterior Part, the broad and very ſtrong Tendon which is at the *Calcaneum* becomes very hard and ſtrait; and the Foot is ſmaller, becauſe the *Tibia* and the Joint are puſhed forward upon the Foot, and occupy a conſiderable Part of it, which of Conſequence muſt make the Foot appear leſſer and ſhorter.

In caſe this Luxation be made backwards, the Heel is ſcarce to be ſeen, becauſe the Joint is fallen or ſunk down upon the Heel, the Sole of the Foot is larger, and the Foot ſeems to be longer. If theſe Signs are manifeſtly apparent to the Eye, you may then conclude it to be a perfect Luxation; but if they are not very manifeſt, it is only an imperfect one.

The Reduction is not very difficult, provided you manage your Extenſion as you ought to do; and may be accompliſhed by the Help of your Hands, if the Luxation be recent, and in an infant Body: So that one of the Servants take hold of the Feet with his Hands, and the other of the Leg above the Joint of the Foot; and thus make an Extenſion, whilſt the Chirurgeon thruſts it to the oppoſite Part.

But in caſe you find that you can't make a ſufficient Extenſion with your Hands, you muſt make uſe of the Bridles on the Foot, and on the Leg, above the *Talus*, in the thinneſt Part.

But if the Extenſion muſt be exceſſive ſtrong, you may make uſe of the Bench of *Hippocrates*.

After the Repoſition of the Joint, the Patient muſt be kept in Bed much longer than is uſually done in other Luxations, *viz.* for Forty Days; becauſe the whole Body is ſupported by the *Talus*: And therefore, if this Reduction be not perfectly well made, *i. e.* unleſs the relaxed Ligaments and the diſtended Muſcles have Time given them to be reſtored to their full Strength, the Patient will be in Danger of a Recidive, or a Second ſlipping out of the Joint; or elſe will be ſenſible of a conſiderable Weakneſs for a long Time after.

For this Purpoſe, you muſt alſo make Applications of the adſtringent Powders beaten

ten up with Whites of Eggs, and apply theſe with Stupes round about the Joint. If there be Pain, you muſt make Uſe alſo of ſoft Medicaments.

The *Oſſa Pedii* and *Turbi* are ſo ſtrongly tied together, that they never ſuffer a Luxation.

The Bones of the Toes do alſo rarely ſuffer a Diſlocation, becauſe they do reſt upon many, and thoſe very ſtrong Ligaments, as well as Tendons.

Their Repoſition is the ſame as thoſe of the Fingers, as deſcribed above in the Seventh Chapter.

Of the Fracture of the Skull which does not reach to the Dura Mater. *From the ſame Author.*

IF the Skull be hurt by an Inſtrument that is either cutting or piercing, there can be no Fracture without a Wound or Diſruption of the Skin; but if this Fracture be made by Contuſion, or ſome blunt Inſtrument, it may be either with or without a Diſruption of the Skin that lies over it.

Beſides which, this Fracture or Fiſſure does either reach or cauſe a Diſruption in the whole Skull, or elſe only in one Part of it.

We will here ſpeak firſt of the ſlighteſt Sort of Fracture, which does not penetrate to the *Dura Mater.*

In caſe therefore a Fracture happens in the Skull, without a Solution of Continuity in the ſuperjacent Skin, you muſt make an Inciſion in the Skin, in the Form of a Rectangular Croſs, in order to diſcover the Fiſſure, and therefore you muſt not only cut aſunder the Skin, but the *Pericranium* alſo, and draw it from the Fiſſure.

After you have diſcovered the Fiſſure, *Avicenna* is of Opinion that you muſt proceed immediately to the ſcraping of the Skull with a Knife, as long as you ſee any Footſteps of it; but *Celſus* adviſes us, firſt to try what we can do with Medicaments and if theſe fail of Succeſs, than to proceed to the Operation with the Knife. But in this Point, I am of a contrary Opinion with *Celſus.*

Firſt, becauſe in all Wounds of the Head, which are ſufficiently dangerous of themſelves, it would turn to a very ill Account to expect the coming of the pernicious Symptomes firſt, and after this attempt to provide againſt them, when, doubtleſs, the Opportunity of providing againſt them will be loſt.

Beſides that, the Reaſon alledged by *Celſus* againſt the Uſe of the Iron Inſtrument is frivolous; for, ſays he, the *Callus* that grows within the Fiſſure, is a much better Tegument to the Brain than the Fleſh that grows where the Skull has been ſcraped. For when we either ſcrape or perforate the Skull with the *Terebræ*, we don't make any conſiderable Opening or Dilatation in the Bone; but if we did, it would not turn to the great Detriment of the Patient; ſeeing there are many Perſons who lead a very healthful and commodious Life, and yet have conſiderable Pieces wanting in the Bones of the Head.

Beſides that, if, according to *Celſus* his Opinion, the Bone be not ſcraped at the Fiſſure, it will moſt commonly turn black; and then we are forced in Spite of our Teeth to come to the Abraſion. And if, according to *Galen*, the Skull is to be ſcraped, if it be only bared, tho' not fractured, How much the more will it be requiſite when it is actually ſplit or crack'd: And this for Three Reaſons;

Firſt, becauſe in the Fiſſure there will of Neceſſity appear a *Sanies*, which deſcends from the ſuperjacent Lip, which will cauſe in the Bone and other ſubjacent Parts a Corruption and Inflammation (for the Bones alſo are ſubject to Inflammations); but when the Bone is ſcraped thin, we prevent this Gathering of the *Sanies* with Eaſe, becauſe we can deterge it.

Secondly, the Lips of a fractured Bone are rugged and unequal, ſo that the Fleſh can't touch upon them without Danger; but theſe Aſperities are taken off by Deration.

Thirdly, By the Aſſiſtance of the Knife we may diſcover exactly the whole Depth of the Fiſſure, a Thing of great Conſequence in the Fractures of the Skull.

Furthermore, ſome Knives are Inciſion or rather Exciſion Knives, which cut out a Piece of a Bone as the Joiners do a Piece of Wood; and among theſe, ſome are triangular, others quadrangular, and ſome round. Beſides, we have alſo peculiar Knives or Engins for Deration or Rugination of the Bone.

In the Uſe of theſe raſping Knives, you muſt above all Things take Care, that you don't unpair the *Pericranium*, which would produce Feavers, Inflammations, *&c.* and the next Thing you are to do, is to cover the Lips of the Wound with ſmall Pieces of Linen Cloth, that they may not be impaired, either by the Air, or elſe by the Knife.

This done, you muſt ſcrape over the Fiſſure according to its Length, as long as you are able to diſcover the Tract of the Fiſſure; and this you may be ſatisfied in, in caſe you beſmear the Fiſſure with Writing-Ink. If you are afraid of the *Chalcantum*, you may have your Ink made out of Gall-Apple only, eſpecially in the Beginning, if there be a Suſpicion that the Fiſſure does penetrate to the *Dura Mater*; but if you put on but a ſmall Quantity, and ſoon wipe it off again, common Writing-Ink will do well enough.

But leſt the Rugine ſhould grow hot in the Operation, and cauſe an Inflammation in the Bone, ſome dip it in *Ol. Roſac.* both to prevent Inflammation, and to make it the more ſlippery; and that in caſe they ſhould by Miſchance happen to touch upon the Lips of the Wound, it may not prove ſo painful, by Reaſon of the Oil. But I rather chooſe to change my Rugines, becauſe by the Inunction the Edge of the Knife is apt to be blunted.

After you have ſcraped the Bone, you muſt come to the Application of proper Medicaments; firſt of all *Digeſtives*, till you ſee a laudable *Pus* appear, and afterwards Sarcaticks.

But becauſe we have two different wounded Parts to manage, *viz.* the Skin and the Bone, therefore we muſt in the Bone, as being a very dry Body, make uſe alſo of more drying Remedies than in the Skin; as the *Rad. Irid. Thur. Sarcocolla, Myrrh. Cort. Rad. Opoponacis, Ariſtoloch. Sang. Drac.* and other ſuch-like Remedies as are very drying, but without any corroſive; all which being reduced to a very ſmall Powder, muſt be ſtrewed upon the Bone, both where it is and where it is not ſcraped.

But even in the Uſe of theſe Powders, you muſt accommodate your ſelf to the Circumſtances of the Wound, and of the Patient.

For if the Wound be ſmall, and a moiſt Habit of Body in the Patient, the *Thus* alone will be ſufficient; but if the Wound be large, and the Patient of a dry and ſtrong Conſtitution, the *Manna Thuris* is more proper, becauſe it both dries and deterges more ſtrongly than the *Thus* it ſelf.

If the Wound be ſordid, and require ſtronger Detergents, you muſt apply the *Myrrha*. If it be in the cold Seaſon, hot Remedies are moſt uſeful, as the *Iris Ariſtoloch. Cort. Rad. Opoponacis*. If it be in the Summer, make Uſe of the *Sang. Drac. Corn. Cervi*, and other refrigerating Remedies.

To the wounded Skin, or Lips of the Wound, you muſt apply Remedies of a ſoft Body or Conſiſtency, as Unguents. Therefore if the Wound be not very large, and the Conſtitution of the Body moiſt, as in Children and Women, and the Seaſon be temperate, you may apply the *Unguent. e Succ. Beton.* Oil, and Wax. But if the Wound be very large, the Patient of a dry Conſtitution, and in the Winter-time, the *Unguent. Iſidis, Unguent. de Gumm. Elemi, Unguent. de Matriſilva*, are very proficuous; for in the Winter-time you muſt apply more hot Remedies, more drying, and more detergent. If the Wound be very large, and the Patient of a robuſt Conſtitution, and in the Summer, the *Unguent. de Thuſia* is very proficuous.

When the Wound is fill'd up with new Fleſh, then you muſt cicatrize both the Bone and the Lips of the Wound with Epuloticks, and ſuch other external Applications as are made uſe of in the ſimple Wounds of the Head.

Of the Fracture of the Skull which penetrates to the Dura Mater, *but without wounding it.*

A Fracture of the Bone that penetrates to the *Dura Mater*, is either a Fracture only, or elſe a Fracture and Depreſſion of the Bone; and in either may be a Fiſſure, which is either ſtrait and ſmall, or elſe wide.

In ſuch like Fractures, Two Things are more eſpecially to be feared:

Firſt, that the Humour don't deſcend or fall upon the *Dura Mater*; for if it putrifies and inflames, it corrupts all that lies underneath it: Whence enſue Feavers, *Delirium*, Convulſions, and laſt of all, Death.

Secondly, the Depreſſion of the Bone on the Separation of ſome Piece of the Bone, which may prick the Membrane, which will produce moſt acute Pains, Convulſions, and ſometimes an Apoplexy.

The laſt of theſe is not very common, but the firſt ſeldom miſſes, and can't be prevented; for the Bone being weaken'd by the Fracture, it is rendered incapable of concocting its proper Nouriſhment: So that of Neceſſity ſome excrementitious Moiſture muſt be ſeparated within the Fiſſure, and more of it falls down from the ſuperjacent Parts thro' the Fiſſure upon the *Dura Mater*, which, what with its Weakneſs, what with the ſtraitneſs of the Fiſſure, cannot be thruſt outwards.

And hence it is, that moſt of thoſe that die of the Wounds of the Head, die upon that Account, as I have often frequently obſerved in the Diſſections of their dead Bodies: Whence it is alſo apparent, that the main Intention in the Cure of theſe Wounds, is to bring forth this Matter.

Therefore in caſe the Fracture be not ſufficiently open; *i. e.* if there be not a ſufficient Opening or Paſſage for the *Sanies*, we muſt cut out or perforate the Bone, that ſo you may both deterge and cleanſe the Membrane from the Membrane, to give it a free Paſſage, and if there be a Sliver of the Bone that pricks the Membrane, it may be taken out.

So that there are two Indications for the Terebration; *Firſt*, in caſe you fear the deſcending of the *Matter*; and *Secondly*, If there is not a ſufficient Paſſage for the Diſcharge of the Matter. As on the contrary, if the Fiſſure be pretty wide, or if the Fracture does not penetrate into the whole Bone, nor be attended with a Contuſion, and without any Fear of a *Sanies* being contained within it, you muſt not proceed to the Trepaning of the Skull, that you may not bare and expoſe to the Air the *Dura Mater* without Neceſſity.

But here ariſes a Queſtion, *viz.* Whether ſuppoſing the Skin of the Head to be entire, and the Fracture of the Skull apparent by its proper Signs, we ought to make an Inciſion in the Skin, and a Perforation in the Bone that lies underneath it? Some are both againſt the Inciſion, and the Trepan.

Their firſt Reaſon is, That as in other Fractures, in caſe the ſuperjacent Skin be entire, Nature will produce a *Callus*, and ſo there is no need of an Inciſion; ſo will Nature produce likewiſe a *Callus* in the Fractures of the Skull. Their Second Reaſon is, Becauſe Nature does in other Fractures thruſt out the Blood that is gathered about the Fractures; whence it is that we ſee often the Linen Cloths ſtained with Blood; ſo Nature is likewiſe capable of expelling the deſcending Matter without the Skin, in the Fractures of the Skull.

But I think *Celſus* his Opinion is preferable to theirs; *viz.* to make an Inciſion into the Skin whenever there is a Suſpicion only of a Fracture underneath it, even tho' we are doubtful whether we may not make our Inciſion in vain; becauſe it ſoon heals again, and is not of a very exquiſite Senſe.

To anſwer their Objections, it is to be obſerved, that there is a conſiderable Difference betwixt the Fractures of the Skull and of the other Parts; for in other Fractures, Nature may without much Difficulty thruſt forth

forth the Matter, by Reaſon of the Softneſs of the Fleſh and Skin that lies above them: Beſides that, in theſe Fractures the Humours are preſs'd out by the Help of the Bandage, which is not to be done in the Fractures of the Head, neither is there a *Callus* generated in the Fractures of the Head; for before that can be accompliſh'd, the Patient dies by the heaping up of the *Sanies* upon the *Dura Mater*.

They object alſo againſt the Terebration of the Skull; *Firſt*, becauſe upon the Perforation of the Bone, the Heat will be diſperſed, which, if detained within, would be able to diſcharge the deſcending Matter thro' the natural Paſſages, *viz.* the Noſe, the Palate, the Eyes, the Ears, and the Glands behind the Ears. *Secondly*, in the Operation of the Trepan it may eaſily happen, that you tear aſunder a Vein, prick a Membrane, or cauſe a Convulſion in the Brain: Beſides that a Patient has a natural Abhorrence for Iron Inſtruments.

But *Hippocrates* is poſitive in this Point of the Perforation to be adminiſtred when there is a Contuſion in the Skull, whether the Fiſſure be apparent or not; and to prevent the Expiration of the Heat, we muſt apply Emplaſters and Compreſſes. 'Tis not to be denied, but that Nature ſometimes will diſcharge the *Matter* thro' the natural Paſſages; but ſince ſhe does not ſo at all Times, it would be unreaſonable to hazard the Patient's Life upon ſo doubtful an Account.

They pretend to check the falling down of the *Sanies* by the following Remedies.

They apply to the Head very hot Emplaſters *e Gummi Elem. refin. Vini, Opoponac. Bdellio, Calam. Aromat. Bacc. Lauri, Ariſtoloch. Rad. Cucum. Sylveſtris*: By which they pretend to draw out the *Matter*. Or elſe they preſcribe internal Remedies, or Compoſitions made of *Cinnamo. Galang. Cardamum, Piper. long. Caryophil. Vin. Aqua Vitæ, Salv. Roriſmarin.* ſuch as have a Quality of diſſolving and conſuming the *Matter*.

But theſe Remedies are ſo violently hot, that when apply'd outwardly, they are apt to draw the Blood and the Matter to the affected Part; not without great Danger of Inflammation; and their internal Preſcriptions will either Occaſion a Fever, or an Eryſipelas in the Wound, and in the Body of the Patient.

We make uſe of different Sorts of Iron Inſtruments in this Operation: Some are called *Scalpra*, or Rugines. Theſe we make Uſe of in thin and tender Bones; or elſe when the Fiſſure has not quite penetrated thro' the Bone. Another Inſtrument is the *Terebra*, or Trepan, not unlike to the *Terebra* or Bore uſed by Carpenters. The Third is, the *Tryphon*, or *Modiolus*, being a round excavated Inſtrument cloſed up at the Bottom, in the Middle of which is a Nail.

Firſt therefore, if the Terebration is to be performed in the Skull, you muſt clear the Bone from the *Pericranium*, becauſe the *Terebra* muſt not touch the *Pericranium*; for great Pain and Inflammation would enſue. You muſt alſo cover the Lips of the Wound with Pieces of Linen Cloth.

When you are to proceed to the Exciſion in the Bone, you muſt take out but ſmall Pieces, becauſe the *Dura Mater* which lies underneath it is ſoon impaired by the Air; not to mention, that we at all Times ought to avoid large Inciſions in the Skin, which muſt of Neceſſity be done, in caſe you pretend to make a large Exciſion in the Bone.

Then you muſt fix your *Modiolus* at about an Inch's Diſtance from the Fiſſure (if there be ſo much Room) preſs upon it with your Left, and turn it about with your Right Hand. Whilſt the *Modiolus* is turning about, you may inſtil a few Drops of *Ol. Roſ.* or Milk, to make it turn the more glib; and dip it now and then in Water, leſt it ſhould grow too hot.

So ſoon as you have penetrated with your Inſtrument to the Interſtice of the Skull, (which you will be ſatisfied in by the Blood that iſſues from thence) you muſt proceed with the utmoſt Caution, and often draw out your Inſtrument, and keep your Left Hand more in Suſpenſe, for fear you ſhould, by preſſing the *Modiolus* downwards, hurt or prick the *Dura Mater* before you are aware of it.

The Inſtrument I make uſe of, conſiſts of a *Terebra* and a *Modiolus*, that has certain Stops which prevents its deſcending upon or hurting the *Dura Mater*.

After the Perforation is made, the Lips of the Opening are to be ſhaved and ſmoothed

with the lenticular Inſtrument; for if the Fleſh grows within a Bone with rugged Edges, it would create Pain; and if ſome of the Duſt be fallen upon the *Dura Mater*, it muſt carefully be wiped off.

The Authors differ not a little in Relation to the Medicaments that ought to be applied after the Membrane is laid bare. For *Avicenna*, with ſome others, are for gentle moiſtening Remedies, as the *Ol. Roſac.* but *Celſus* and others, for drying Medicines; for he firſt ſprinkles the Membrane with ſharp Vinegar, in order to ſtop the Flux of the Blood, if any ſuch Thing happen, and to diſſolve the concreted Blood that might be ſettled upon it; after which he applies Cephalick Emplaſters, ſuch as the *Empl. Virid. Judææ, &c.* which are great Exſiccatives. *Galenus* recommends this in one Place, and deſiccant Remedies in another.

To ſolve this Difficulty it muſt be obſerved, that the Applications that are made to the *Dura Mater* are deſigned only to prevent its being impaired by the *Matter* that may fall upon it; and this is effected, firſt of all by rendring that Matter which is ſharp, corroſive, and corrupted, of a benign Nature, which End is anſwered by turning it into a laudable *Pus*. 'Tis according to this Indication, that *Avicen*, *Hippocrates*, and ſometimes *Galen* alſo, and the ancient *Roman* Chirurgeons, as well as our Moderns, had in View, when they applied the *Oleum Roſatum* to the *Dura Mater*; *viz.* to convert the *Matter* into a laudable *Pus*. This Oil may be rendered more ſuppurative, if it be drawn from ripe Olives.

Beſides the *Oleum Roſaceum*, *Galen* recommends alſo the Blood of Pidgeons and Turties, it being an excellent Suppurative. Our Chirurgeons make uſe alſo beſides theſe of the *Reſin. Abiet.* commonly called the *Oleum Abiegnum*, which they mix with the *Ol. Roſaceum*, and that not without good Reaſon in my Opinion; for Digeſtives ought to be endued with an Emplaſtick Quality alſo; which the *Ol. Roſaceum* has not of it ſelf, but acquires it by its being mix'd with the *Reſin.*

However, you may alter this Mixture of the Oil and the Reſin, according to the Conſtitution of the Patient, of the Wound it ſelf, the Seaſon of the Year, and according as the Pain is either more or leſs violent.

Thus in Children and moiſt Conſtitutions, we make uſe of the compleat *Oleum Roſaceum*, *i. e.* ſuch as is drawn from ripe Olives; but in adult Perſons, and of a hot and dry Conſtitution, we mix the *Oleum Abiegnum* with the *Oleum Roſaceum*.

In the Beginning, ſoon after the Wound is given, we mix more of the *Ol. Roſac.* with the Reſin, by Reaſon of the impending Inflammation; but afterwards, when the *Sanies* is to be diſcharged and dried up, you muſt add more of the Reſin. Thus in the Winter we add more Reſin, and in the Summer more of the *Ol. Roſac.*

Thus if there be an exquiſite Senſe of Pain in the Wound, the *Oleum Roſaceum* is moſt proficuous; becauſe the Reſin may be too acrious by Reaſon of its detergent Quality. For the ſame Reaſon that we mix the *Oleum* or *Reſin. Abiegn.* with the *Ol. Roſac.* we may make uſe alſo of the *Reſin. Terebinth.* Moſt Chirurgeons make uſe of the *Oleum Maſtich.* and this they do, when, by Reaſon of the hot and dry Diſpoſition of the Head, (and yet there is an acute Senſe) they dare not apply the Reſin. In which Caſe you may alſo mix with it the *Oleum Hyperici*, which is both a Digeſtive and an Emplaſtick.

This is the firſt Way by which we intend to prevent the *Dura Mater* being impaired by the Matter that falls upon it.

The Second Way is performed by exſiccant Medicines; ſuch as conſume and dry up the Matter; and 'tis this that *Celſus*, and ſometimes *Galen* alſo, and the *Aſiatick* Phyſicians, have a Reſpect to in their Cures; for *Galen* approves of both.

In our modern Practice we apply Digeſtives, and therefore inſtil the *Ol. Roſac.* lukewarm, either by it ſelf, or elſe mix'd with Reſin, or ſome other Things. After this we apply a Sindon, being a round Piece of Linen Cloth adapted exactly to the Circumference of the Wound, dipt in *Ol. Roſac.* over the Opening, to prevent the other Dreſſings that are to be laid over it from falling into the Opening, and making a Compreſſion upon the *Dura Mater*, or from inſinuating themſelves betwixt the Skull and the Membrane, to the great Danger of the Patient.

After

After which, you may lay Compreſſes dipp'd in *Ol. Roſ.* over the beforeſaid round Sindon.

Some apply a broad double-folded Piece of Linen Cloth, dipp'd in Wine and Oil, or *Ol. Roſ.* all round the Wound; after which you need only apply ſuch a Bandage as will keep the Medicaments upon the Wound. In my Practice I apply the *Empl. Hippocratis*, made of the *Farin. Hord.* over the Linen Cloths, dipp'd in *Ol. Roſ.* But here ariſes another Queſtion, *viz.* How long we ought to make Uſe of the Digeſtive, or the *Ol. Roſ.* *Galen L. 6. c. ult.* tells us, That we may apply it till the Time of the Inflammation be paſt, and every Thing be fully dry: Then you may proceed to the Sarcoticks, or Incarning, and after that to Cicatrizing. *Celſus* ſays, That the Fifth Day will ſhew how the Inflammation is to be: And others again are of Opinion, That after the Third Day you muſt charge your Remedies, *i. e.* you muſt abſtain from Digeſtives.

In this Diſcrepancy of Authors, tho' in a Thing of the greateſt Moment, the beſt and ſafeſt Way is to guide our ſelves according to the Indications that fall in our Way, and to make Uſe of Digeſtives as long as you find it indigeſted, and till it be brought to a Kind of Suppuration; which will happen the ſooner, in caſe the Wound be but ſmall, the Head warm, and in the Summer Seaſon: For if we deſiſt from the Digeſtives before its due Time, we are not ſecured againſt Inflammation; but on the other Hand, if you perſiſt beyond the due Time in the Uſe of Suppuratives, the Member will, by the too long and frequent Application of the Oils, and the long Continuance of the purulent Matter upon it, cauſe a Corruption there. It is however my Opinion, That if we are to incline to one of theſe two Extreams, you had better not be over-ſcrupulous in expecting a quite perfect Digeſtion, than to perſiſt too long in the Uſe of the Digeſtives.

When you ſee a laudable *Pus* appear, it muſt be cleanſed, and the Membrane dried; and therefore you muſt add more of the Reſin to the *Oleum Roſaceum*; or in moiſt Conſtitutions we apply ſuch Remedies only as have a detergent Quality. If there be a great Quantity of the purulent Matter, you may, inſtead of the Reſin, make Uſe of the *Mell. Roſ. Syr. Roſ.* either by themſelves, or mix'd with other Remedies.

After you have deterged and dried the Wound, you muſt proceed to the Sarcoticks, and apply them over the *Dura Membrana*, or elſe the *Unguent. de Betonica, de Matriſylva, de Gummi Elemi*, or *Unguent. Iſidis*; and in Regard to the Bone, we apply what we call the Cephalick Powders, as the *Pulv. Iridis, Ariſtoloch. Peucid. Myrrhæ, &c.* and at laſt cicatrize.

Hence it is apparent, how much thoſe Chirurgeons are in the Wrong, who pretend to regulate the Cures of theſe Wounds, not according to the different Stations or Times of the Diſeaſe, but by a certain ſet Number of Days; for till the Fourth Day they make Uſe of *Ol. Roſ.* and from the Fourth to the Seventh they mix Reſin with it; from the Seventh to the Eleventh Day, or elſe to the Fourteenth, they apply *Unguent. de Betonica*, and after that the *Unguent. Iſidis.*

But conſidering that a Regard muſt be had as well to the circumjacent Parts as to the Wound it ſelf, therefore you muſt, beſides the before-mentioned Remedies, make Uſe of Refrigerants alſo, to repel the Influx of the Matter; as alſo of exſiccants, to conſume the Matter that is fallen thither already; and laſtly, of Adſtringents to corroborate the circumjacent Parts.

For this Purpoſe *Hippocrates* preſcribes a Compoſition for an Emplaſter, *e Farin. Hord.* and the *Ol. Roſat.* which muſt be applied over all the before-mentioned Remedies. The exterior Part of the greateſt Part of the Head, the Neck behind and before, but eſpecially the Jugular Veins, muſt be anointed with *Ol. Roſ.* warm; and this external Application is made, partly to aſſwage the Pain, if there be any, partly to refrigerate the Blood.

You may alſo alter this Emplaſter according to the Seaſon of the Year, the Circumſtances of the Wound, and Symptoms, and the Conſtitution of the Head. In the Summer-Time we prepare it thus:

Rs. *Farin. Hord. Unc.* viij. *Ol. Roſ. Unc.* iv. *de poſca*, (*i. e.* Vinegar and Water) *q. ſ. ad conficiend. Emplaſtr.* In the Winter you may prepare it with Wine.

In caſe the Head be very weak, we add, beſides the *Ol. Roſ. & Far. Hord.* Two Ounces of *Pulv. Roſ. Rub.* and make it up into an Emplaſter with Wine.

In caſe the Wound be made by Contuſion, or attended with a Contuſion, we intermix alſo Adſtringents and Diſcutients: As for Inſtance:

Rs. *Farin. Hord. Unc.* vj. *Myrtill. Unc.* ij. *Ol. Roſ. Unc.* iv. *Oxymel. ſimpl. Unc.* iij. *Vini Alb. non potent. q. ſ. miſc. f. Emplaſtrum.*

If the Head be very weak and cold, you may add alſo ſometimes a ſmall Quantity of *Pulv. Beton. aut Stœchad. aut parum Spicæ.*

Of the Wounds of the Dura Mater.

IF the Wound or Fracture penetrates ſo far as to wound the *Dura Mater* it ſelf, you muſt, after the univerſal Cure, which has a Reſpect to the Profuſion of Blood, and the Inflammation, conſider what is moſt proper to be applied to the vulnerated Part.

The Wound of the *Dura Mater* has this Peculiar, that it is exceeding painful; whence ariſes the Firſt Indication, *viz.* to aſſwage the Pain.

The next Indication muſt be ſatisfied by Terebration of the Bone, unleſs it be fractured aſunder before; for ſince in this Wound both the Skin and the Skull is impaired, you muſt endeavour to check the Matter that falls from above upon it.

The Third Indication requires either an Agglutination, or elſe an Incarning of the *Dura Mater.*

Firſt of all therefore you muſt aſſwage Pain, to avoid Inflammation and Convulſions. The Pain is aſſwaged, generally ſpeaking, by removing the Cauſe thereof; but this cannot take Place here, becauſe the Wound it ſelf is the Cauſe of that Pain, which muſt be forthwith allayed; or elſe by ſtupifying Medicaments, which will alſo not be admitted of in this Caſe, becauſe this would render the Membrane inſenſible; or laſtly alſo, by Lenitives, as by the unctuous Medicines and Oils, which are the only that may ſafely be applied here; more eſpecially ſince theſe Oils are contrary alſo to the *Matter* that falls upon the Membrane.

'Tis to anſwer this End that we drop the *Oleum Roſaceum* lukewarm upon the Membrane; or elſe we open a Vein under the Wing of a Pidgeon or Turtle-Dove, and inſtil ſome of the Blood warm upon it, to appeaſe the Pain, and promote Digeſtion.

If the Pain be not very urgent, you muſt have the more Regard to the Matter that falls from above upon the Membrane; and to anſwer this Indication, you muſt apply ſuch Remedies as are ſtronger Digeſtives, as the *Reſina*, or *Oleum Abiegnum*, *Oleum Maſtichinum*, *Oleum Hyperici.*

You muſt apply theſe Remedies either until the Pain be aſſwaged, or elſe the *Pus* do appear in the Wound; but when you ſee the Suppuration, you muſt leave off the Oils, for fear of cauſing a Corruption in the Membrane: But inſtead of theſe, you muſt cleanſe and dry the *Dura Mater* with *Mell. Roſat. vel Syr. Roſ.* or elſe with the before-mentioned Remedies.

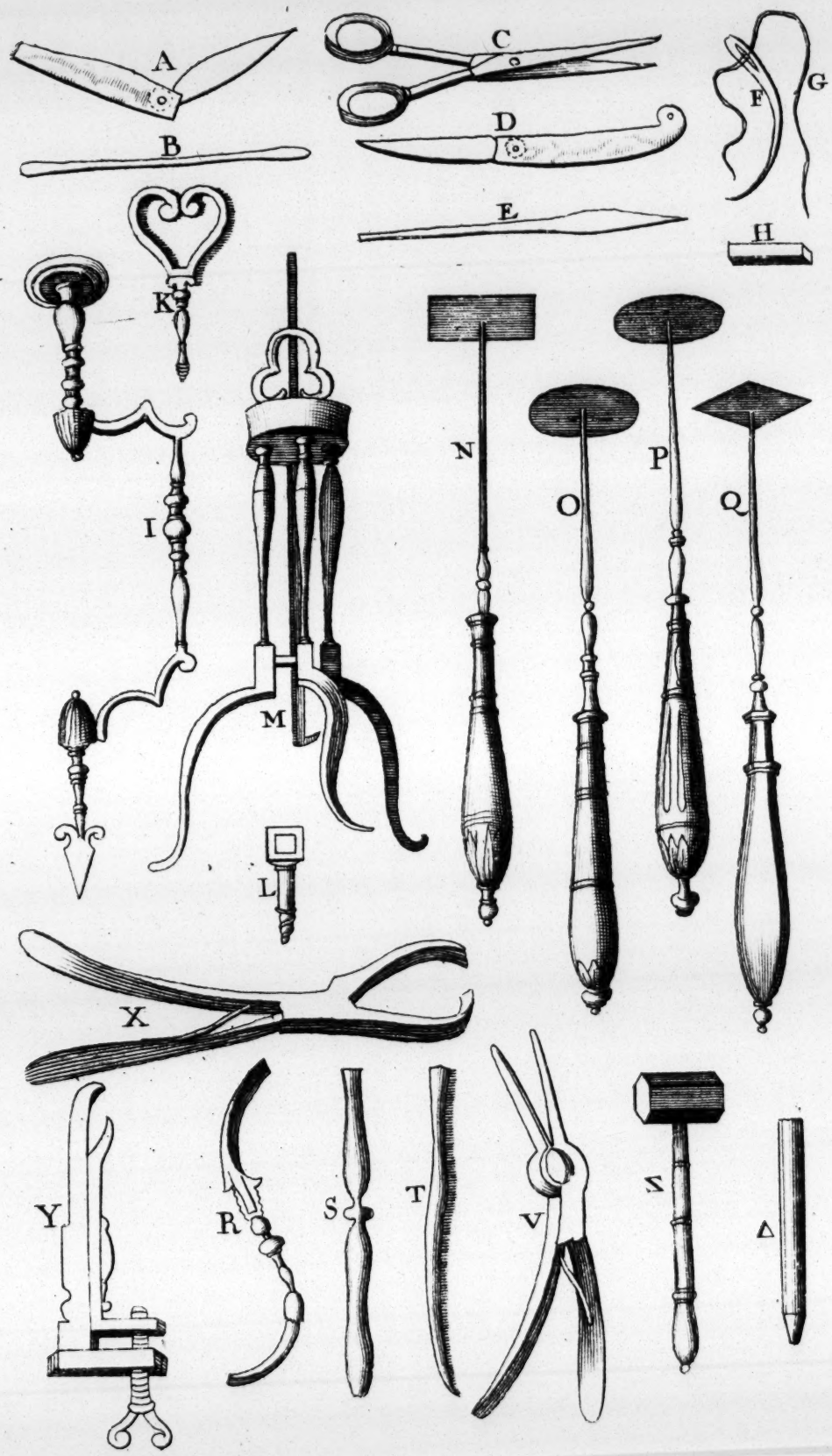
This done, you muſt now proceed to the Cure of the Wound of the *Dura Mater*, which does require a Reunion. But though the *Pia Mater* may be conſolidated by Agglutination, by reaſon of its ſoft Subſtance, the *Dura Mater* will not admit of Agglutination, becauſe it is hard, nervous, and thin; eſpecially if we conſider, that in order to procure a Reunion in a Wound, it is requiſite that the Lips thereof ſhould be brought ſo cloſe together, as to touch one another; which being performed by Sutures and Bandages, neither of theſe can be applied in the wounded *Dura Mater.*

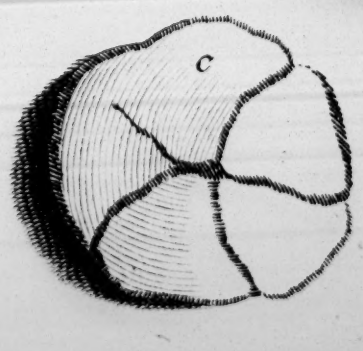
Archigenes does indeed aſſert, That this Membrane may be re- *L. 2. C. 1.* united by Agglutination; but if you duly conſider the Qualifications of the Remedies he preſcribes, they participate much more of Sarcoticks, or ſuch as generate Fleſh, than of Agglutinatives. And *Galen* ſays, That this Membrane when wounded muſt be cured by the Generation of Fleſh, ſo as that the whole Wound be fill'd up with Fleſh.

Archi-

Instruments belonging to the Chirurgical Operations on the Skull by Mons^r. Dion. &c.

N°. I.





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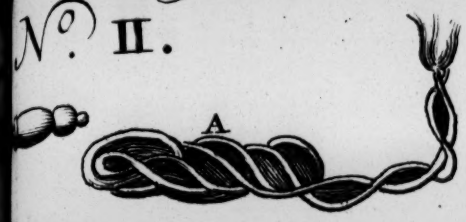

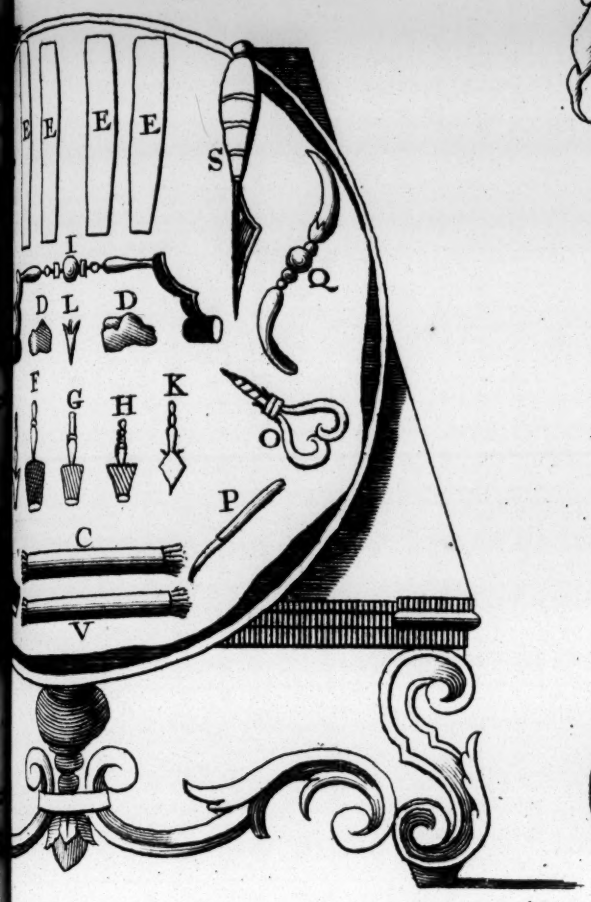

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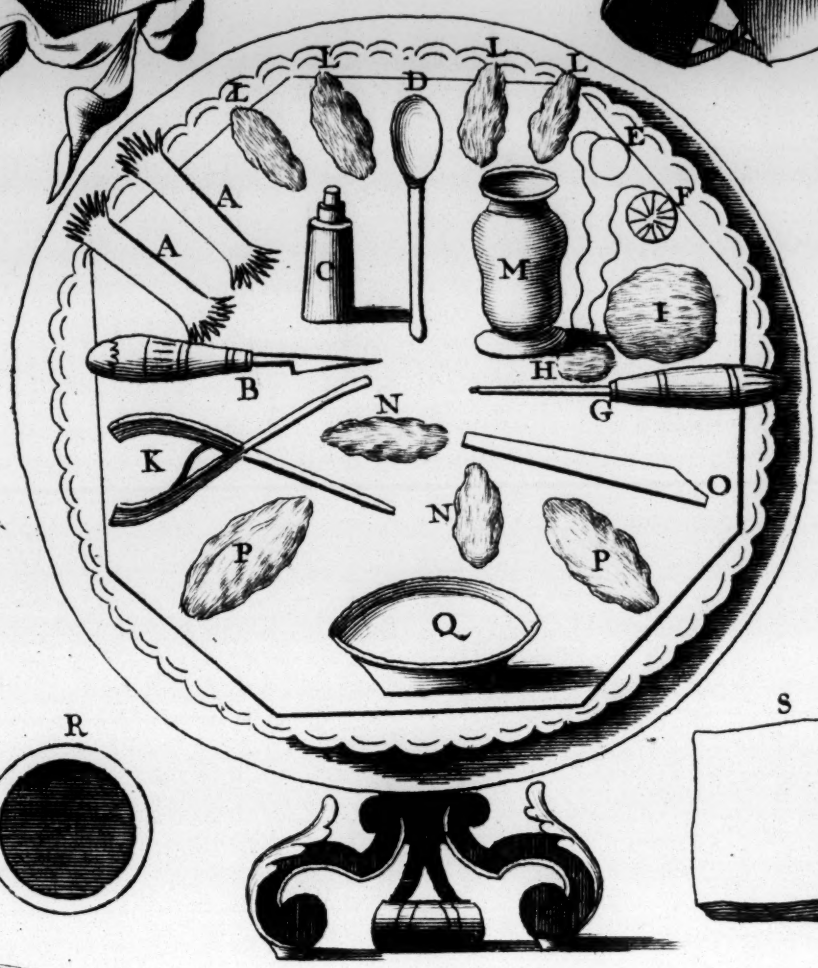
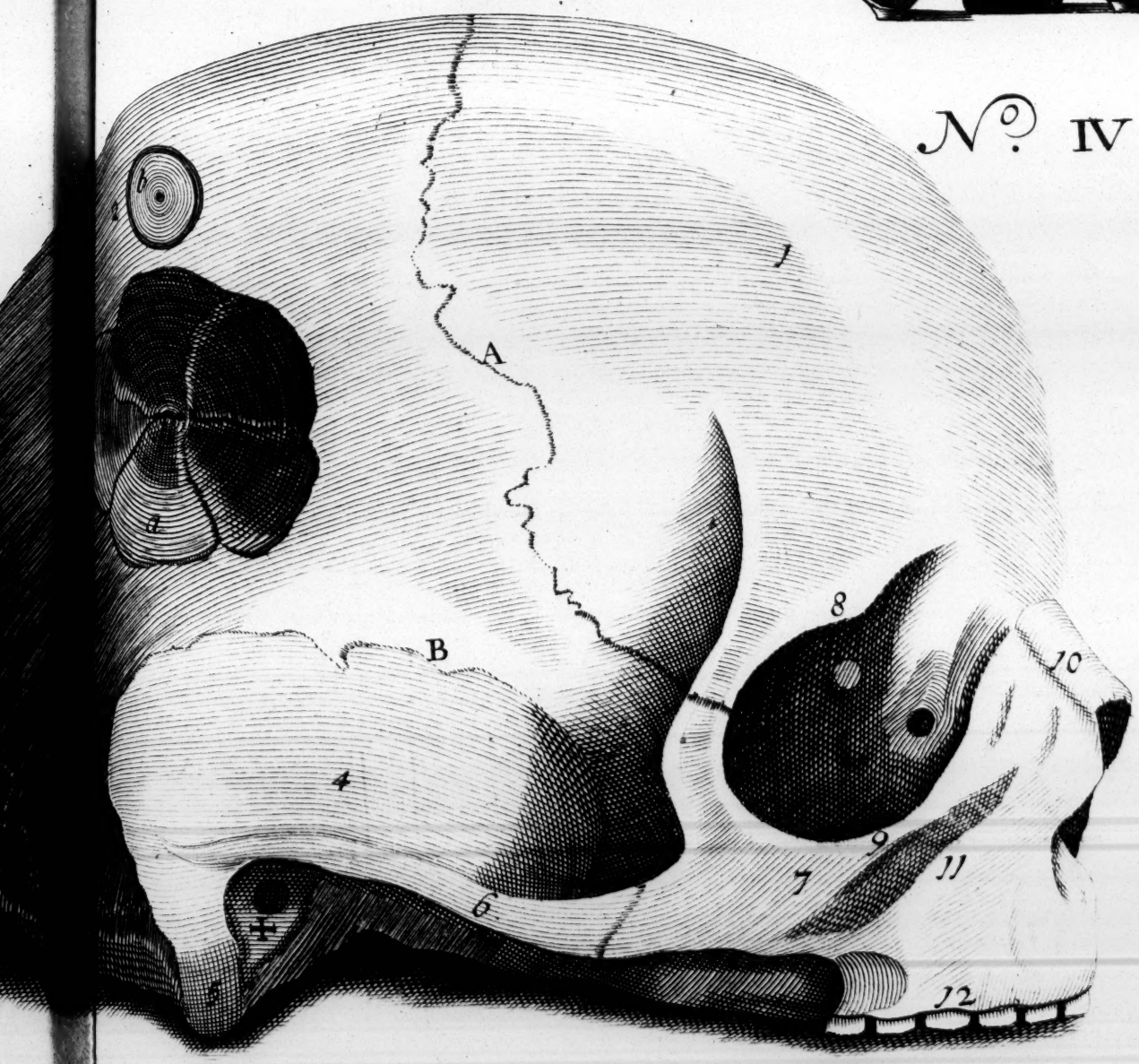


N.o IV. See page. 579



Case of an uncommon Fracture of the Skull.

Archigenes, as well as *Galen*, do pour the *Succ. Calaminth.* upon the *Dura Mater*; after which they ſtrew over it *Farin. Milii*, to moderate the Heat of the *Calamintha*; and theſe being drying and detergent Remedies, do conſequently generate Fleſh.

Beſides which, you may apply a Compoſition made up of Butter, *Ol. Roſ. & Adipe Suill. veter.* which may both digeſt and generate Fleſh in the Lips of the Wound.

An Explanation of the Table, containing the ſeveral *FIGURES* belonging to the Cure of the Contuſions and Fractions of the Skull. Taken from Monſieur *Dionis*, Chirurgeon to the Dutcheſs of *Burgundy*. Done from the new Edition, juſt printed at *Paris*.

No I. *repreſents the Inſtruments belonging to the Chirurgical Operations on the Skull.*

A, Repreſents the Lancet for Abſceſſes, wherewith to make a crucial Inciſion in the Contuſions on the Head.

B. A Silver Probe, to probe the Wounds on the Head.

C. The pointed Sciſſars.

D. The Biſtoury.

E. The Knife call'd the Mirtle-Leaf, for the Separation of the *Pericranium*.

F. A crooked Needle, threaded with wax'd Thread, *G.* wherewith to tie the Artery on the Head.

H. A ſmall Compreſs of Linen Cloth, whereupon the Knot of the Thread is to be made.

I. The Perforatife, unto which is to be faſten'd,

K. The Tirefonds, or Elevator, for the pulling up of the depreſſed Skull.

L. Another Tirefond of a leſſer Size, to be faſten'd to,

M. The Elevatory call'd the *Triploides*.

N. A flat Scraper wherewith to raſp the Skull.

O. An oval Scraper deſigned for the ſame Uſe.

P. A round Scraper for the ſame Uſe, but which ſinks deeper into the Skull.

Q. The finiſhing Scraper, being pointed.

R. A crooked Elevatory, deſigned for the taking out of the ſmall Splinters or Shivers of Bones that preſs upon the *Dura Mater*.

S. A flat Elevatory deſigned for the ſame Uſe.

T. A Third ſtreight Elevatory, but only a little crooked at its Extremity, deſign'd for the ſame Uſe as the Two former.

V. A Pair of Pincers ſhaped in Form of a Raven's Beak, adapted for the ſame Uſe as the Elevatories.

X. A Pair of Inciſive Pincers, to cut off the Prominences of a Piece of a Bone on the Skull.

Y. Another Pair of inciſive Pincers, made with a Screw, which work with greater Strength.

Z. A Leaden Hammer.

Δ. A Sciſſal, wherewith to cut off a Piece of a Bone that ſtands out above the Skull.

No II. *repreſents the Inſtruments and other Implements belonging to the Operation of the Trepan.*

A, Is a twiſted Wax-Candle or Taper, to give Light to the Operator.

B. A Chafing-diſh with Fire, to be held in the Middle over the Bed during the Operation.

C. A falſe Tent of Lint, wherewith to cleanſe the Wound.

D, D. Two Pieces of Lint or Cotton, to ſtop into the Patient's Ears.

E, E,

E, E, E, E. Four ſmall Bandelets, wherewith to dilate or keep aſunder the Lips of the Wound during the Trepan.

F, G, H, Are Three Crowns or Heads belonging to the Trepan, of a different Size.

F, Is the biggeſt of the Three.

G, Is of a middle Size; and,

H, Is the leaſt of all.

I. The Virebrequin.

K. The Perforatiſe, on which the Virebrequin is to be mounted.

L. The Pyramid belonging to the *Crown, G.*

M. The Inſtrument wherewith to take out the Pyramid.

N. A ſmall Bruſh wherewith to clean the Crown from the Blood and Duſt of the Bone.

O. The Tirefonds, to take out the Piece of Bone after Terebration.

P. A Pen or Quill, cut like a Tooth-pick, to ſound the Depth of the Terebration, whether it be equal or not.

Q. The Elevatory, to take out a Piece of Bone after the Terebration.

R. The Knife call'd the Mirtle-Leaf, to lift out the Piece of Bone of the Skull when it will no longer bear the Terebration.

S. The lenticular Inſtrument, to cut out the ſmall Inequalities within the Circle of the Aperture made by the Terebration.

T. Another lenticular Inſtrument, wherewith to puſh back the *Dura Mater*, to facilitate the iſſuing of the Blood.

V. The falſe Tent, to imbibe the coagulated Blood.

N° III. *repreſents the Inſtruments and other Things belonging to the Cure after Trepanning.*

A, A. Two falſe Tents of Lint, to imbibe or cleanſe the Aperture of the coagulated Blood.

B. The lenticular Inſtrument, wherewith to cut out the remaining Aſperities within the Aperture, which elſe might prick the *Dura Mater.*

C. A Viol with white Balſam.

D. A Spoon.

E, F. Two Sindons, the Firſt of Linen, and the other of Lint, to be dipp'd in a Mixture heated in the Spoon, and to be laid within the Aperture, the Firſt immediately upon the *Dura Mater.*

G. The lenticular Inſtrument, wherewith they are to be ſtuff'd within the Aperture.

H. A Tampon of Lint, to fill up the Aperture.

I. A Pledgit dipp'd in Spirit of Wine, to be applied to the Part of the Skull that is laid bare.

K. A ſmall Pair of Pincers.

L, L, L, L. Four Doſſils dipp'd in the Digeſtive, *M.* to be applied to the Four Lips of the Wound.

N, N. Two other Doſſils, dipp'd in the ſame Digeſtive, and to be applied to the middle Part of the ſame Wound.

O. A *Spatula.*

P, P. Two large Pledgits, to be laid over the reſt.

Q. The *Oleum Roſatum*, wherewith to embrocate the circumjacent Parts of the Wound.

R. An Emplaſter of *Betony.*

S. A Compreſs.

T. A Napkin wherewith to make a Bandage, call'd the *Couvrechief* or the Kercher.

V. A Woollen Cap to put over all.

Of the FRACTURES *of the* SKULL. *Taken out of Monſieur* Dionis, *chief Chirurgeon to the Dutcheſs of* Burgundy, *his Courſe of Chirurgical Operations, demonſtrated in the Royal Garden at* Paris.

THere are many Sorts of the Fractures of the Skull, each of which are diſtinguiſh'd by their particular Names. I have reduced them under Twelve Heads, which I intend to explain to you in their due Order.

The *Hedra* ſignifies in *Latin* as much as *Sedes*, or *Veſtigium.* It is a ſimple Inciſion in

in the Skull, where the Blow leaves only a *Mark*, without penetrating beyond it.

The *Eccope* ſignifies in *Latin* as much as *Inciſio*, or *Exciſio*, and is a Solution of the Continuity in the Bone, but ſuch a one as penetrates no farther into the Part than the Inſtrument it ſelf did that gave the Blow.

The *Diacope*, in *Latin Præſicio*, or *Diſſectio*, is a Kind of a Fracture where the Blow has been given aſlant, and the Piece of the Bone is only half ſtruck off.

The *Aposkeparniſmos*, in *Latin Dedolatio*, is a Solution of the Continuity of the Skull, where the Piece is taken off, as if it had been cut away with a Hatchet.

The *Trichiſmos* ſignifies in *Latin Rima Capillaris*, and is a Fracture of the Skull, but ſo ſlender, as not to appear any bigger than a Hair; ſo that it is ſcarce diſcoverable, unleſs you put ſome Ink upon the Skull, and after you have wiped it off, you may perceive the Cleft by the Tract the Ink leaves behind it.

The *Regma*, in *Latin Diviſio*, *Rima*, *Seiſſura*, is an apparent Cleft or Fracture which extends beyond the Reach of the Inſtrument wherewith the Blow was given, and where the Bone is not removed from its Place, its Pieces which are ſeparated remaining contiguous and even. Theſe Fractures in the Skull are like the cracks that are in earthen Veſſels.

The *Apikoma*, *i. e.* an Eccho, in *Latin Reſonantia*, is a Kind of a Fracture of the Skull made on the oppoſite Side to that where the Blow was given.

The *Tlaſis*, or *Phlaſis*, in *Latin Contuſio*, or *Colliſio*, is a Contuſion of the Bone made by ſome external Force, or rather a Depreſſion made by an external Violence upon the exterior Surface of the Skull, which is forced inwards without any Crack or Cleft, like as we obſerve them in the Pewter Pots or Veſſels when they are bruiſed.

The *Enthaſis*, or *Ecplaſis*, in *Latin Enarcuatus*, *Deſidentia*, *ſive Illiſio*, is a Fracture of the Skull with ſeveral Cracks or Clefts, to wit, when it is broken in ſeveral Pieces.

The *Ecpieſma*, in *Latin Depreſſio*, is a Fracture of the Skull in ſeveral Pieces, ſome wall of which make a Preſſure upon and wound the Membranes.

The *Engiſſoma*, in *Latin Appropinquatio*, is a Fracture of the Skull, in which one of the Extremities of the fractured Bone is thruſt inwards upon the *Dura Mater*, and the other Extremity is raiſed outwards.

The *Camaroſis*, in *Latin Teſtudinatio*, or *Fornicatio*, is a Kind of a Fracture of the Skull, in which the middle Part of the fractured Bone is raiſed in the Form of an Arch or Vault, and reſembles the Back of a Tortoiſe.

But theſe ſeveral Sorts of Fractures of the Skull may moſt conveniently be brought under Three general Heads, to wit, the *Inciſion*, the *Cleft* or *Crack*, and the *Contuſion*; under which, in Effect, are comprehended all the Fractures I have juſt now mentioned to you.

The *Inciſion* is a ſmall Wound of the Skull, which goes not beyond the Inſtrument that made it, to wit, the *Hedra*, which is no more than a ſimple Mark; the *Eccope*, which is a ſmall Inciſion; the *Diacope*, which does not raiſe any Piece of the Bone; and the *Aposkeparniſmos*, which takes off a Piece as if it had been cut off with a Hatchet.

Theſe Four Sorts of the Wounds of the Skull may be cured without the Trepan.

The *Cleft* or *Crack* is a Solution of the Continuity in the *Cranium*, which goes further than the Inſtrument that gave the Blow. It comprehends Three Sorts of Fractures, to wit, the *Trichiſmos* or *Rima Capillaris*; the *Regma*, or apparent Cleft or Crack; and the *Apichima*, or *Reſonatio*.

The Trepan is required in theſe Three Sorts of Fractures.

The Contuſion is a violent Depreſſion made by ſome Inſtrument, which breaks aſunder and ſeparates the Bones of the Skull which were united together. It comprehends the remaining Five Sorts of Fractures, to wit, the *Tlaſis*, or Depreſſion of the Skull without any apparent Fracture; the *Entlaſis*, or *Illiſio*; the *Ecpieſma*, when the Extremities preſs upon the *Dura Mater*; the *Egiſſoma*, where one Part of the Bone is preſs'd downwards, and the other rais'd upwards; the *Camaroſis*, where the Bone is vaulted like the Back of a Tortoiſe.

Theſe Five Sorts of Fractures are not to be cured without the Help of the Trepan unleſs it be in the *Tlaſis*, for in Children

the

the Bone will ſometimes ſpring back, and reimplace it ſelf immediately after the Blow is given. They are all agreed concerning theſe Fractures of the Skull, excepting the *Apokima*.

All the ancient Authors ſpeak of this Kind of Fracture of the Skull as an unqueſtionable Truth. They tell us, That it is the Air, which being incloſed within the Head, and puſh'd on by the Violence of the Blow upon the Side oppoſite to that where the Blow was actually given, makes that Side ſplit or crack rather than this, if it be more diſpoſed towards a Fracture.

But ſome among the modern Chirurgeons poſitively contradict this Aſſertion, and pretend to prove, That there can be no ſuch Thing as an oppoſite Fracture, becauſe the Skull does conſiſt of ſeveral Pieces, which are not very cloſely united together, which breaks the Force of the Blow; alledging, That we muſt not think that it happens in the Skull as with an Earthen Pot, which by an elaſtick Virtue will ſometimes crack on the oppoſite Side where it is ſtruck, becauſe the ſtreight Union of their Particles makes them to make an equal Reſiſtance all at once; ſo that in what Place ſoever it is weakeſt, it will be apt to crack. They add further, that ſince the Ancients have laid this down as the Uſe of the Sutures, to wit, to prevent the Fracture of one Bone of the Skull from penetrating into another, they ſeem to contradict themſelves in that Point, which they make the Foundation of the *Apixima*: So that (ſay the Moderns) if a Skull is crack'd on the oppoſite Side, or on any other Part but where the Blow is immediately given, this muſt proceed either from a Second or Third Blow, or by a Fall or Hurt the wounded Perſon does not remember, becauſe he was perhaps quite ſtunn'd by the Firſt Blow or Fall.

I muſt confeſs I ſhould be apt to encline to the Sentiment of the modern Authors in this Point, were it not that Two Caſes, which I have had under my own Hands, did oblige me to ſide with the Ancients in their Opinion.

In the Year 1690, a Groom of the Duke *de Chevreuſe* happening to fall from a Horſe in the paved Streets, I was called to his Aſſiſtance. I found a Wound upon the *Os Coronale*. I made a Dilatation ſufficient to admit the Trepan, he being inſenſible. The next Day I found a Fracture in the Bone, which I trepanned; but he did not as yet recover his Senſes. About Three Days after a Tumour appeared upon the *Occiput*, which I opened, and found the Bone fractured. I applyed the Trepan there alſo, when abundance of Blood iſſued forth both out of this and the other Wound; and as the Blood did come forth by Degrees, the Patient began to recover his Senſes. I continued to dreſs the Wound, and he was well cured.

In the Year 1692, a Girl of Nine Years of Age, being near ſome People that were playing at Tenis, the Ball happened to fall upon the Child's Head with ſuch Violence, that ſhe quite loſt here Senſes. I was call'd, and found Two large Contuſions upon the *Oſſa Parietalia*. I opened the largeſt of the Two, and finding the Bone fractured, applied the Trepan. About Two Days after, perceiving that the other Contuſion did not diminiſh, I ſaw my ſelf obliged to open that alſo, and finding the Bone to be fractured, I was forced to apply another Trepan likewiſe. She began to recover her Senſes by Degrees; and the other Symptoms vaniſhed in Proportion as the Wounds came to a Suppuration, and ſhe was fully cured.

The Firſt Hiſtory proves, That the *Apokima* may be from before backwards; and the Second ſhews, That it may be made from one Side to the other; for it is ſcarce to be imagined, that each of theſe Two ſhould have received Two diſtinct Blows or Falls, and that exactly in the ſame Places, which are ſaid to be wounded or crack'd in the *Apokima*.

The Signs of the Fractures of the Skull, as they are repreſented by the beſt Authors, and reduced into a due Order by the Moderns, are diſtinguiſh'd into Two Sorts, to wit, the *Senſible*, or the *Rational*.

The *Senſible Signs* are thoſe that fall under the Senſes of the Patient, and of the Chirurgeon.

Thoſe that have a Relation to the Patient are, when he has heard a crackling Noiſe in the Bone at the ſame Moment when he received the Wound; when he perceives a Sound like a crack'd Pot, if you touch hard

or

or ſtrike upon the diſcovered Bone; when he feels a painful Motion at the Place when he holds ſomething very cloſe betwixt his Teeth: But this laſt is neither a conſtant nor a certain Sign; for I have ſeen when the Patient has been made to keep and draw a Handkerchief cloſe through his Teeth, and at the ſame Time was not ſenſible of any Pain, though the Skull was fractured: And others I have known, who have felt a Pain, though there was no Fracture, becauſe the Wound was upon or near the *Muſculus Crotaphites*, unto which the Motion of the Mandible might eaſily be communicated.

Thoſe belonging to the Chirurgeon are either ſuch as are judged by the Sight, when the Fracture is ſo apparent, as to be diſcernable by the Eye; or by the Touch, when he is able to feel it with his Finger; or when he may diſcover an Inequality in the Bone with the Help of his Probe.

The rational Signs depend upon the efficient Cauſe, the Nature of the Wound, and the Symptoms.

In Regard to the efficient Cauſe, Two Things muſt be well conſidered; *Firſt*, the Perſon that has given the Blow, to wit, whether he be very ſtrong, whether he was in a Rage, whether he ſtruck with a great Force, whether he ſtood higher or above the Perſon that was wounded; being ſuch Circumſtances as ſhew to us, that the Blow was given with the more Force as the oppoſite Circumſtance indigate the contrary to us. *Secondly*, the Inſtrument wherewith the Wound was given: As for Inſtance; if it be a Stick, it muſt be conſidered, whether it were big or little, whether it was of a light or heavy Wood; and in Reſpect to its Figure, whether it was round, four-ſquare, or triangular; in Reſpect of its Subſtance, whether it was of Iron or Lead, ſharp-edged or blunt; or elſe if this Inſtrument happened to be a Stone, whether it was ſmall or large, whether it did fall or was thrown from a high Place, *&c.*

As to what concerns the Nature of the Wound, the Firſt Thing to be taken Notice of is its Bigneſs, for the larger it is, the more ſuſpicious of a Fracture. *Secondly*, whether it is attended with a conſiderable Contuſion; which will convince you, that it has been done by a Puſh or Fall. *Thirdly*, its Situation; for in caſe the Wound happens to light upon a thin Bone, as the *Os Parietale*, it may much eaſier be fractured than if it had been upon a thick Bone, ſuch as the *Os Occipitis*.

As to the Symptoms, you muſt be careful to obſerve of what Nature they are, to wit, whether they have appeared at the very Time when the Wound was received; as for Inſtance; the Patient has been ſtun'd, like an Ox that is knock'd down; the Blood has iſſued immediately after out of his Mouth, his Noſe, and Ears; his Senſes, Speech, *&c.* have left him at the ſame Time, *&c.* or whether they are ſuch as follow upon a Fracture, as Vomitings, the Nauceating of Meats, a Fever, Drowſineſs, *&c.*

A Chirurgeon ought to be well acquainted with all theſe Signs, which will enable him to give a right Judgment of the Matter; which muſt be taken from Three Things, to wit, from the Nature of the Wound, of the Part, and of the Symptoms.

Firſt of all, from the Wound; for ſometimes the Wound is very large in *outward Appearance* only, as moſt of thoſe Wounds are that are given in the Field; but at other Times they are ſuch in their Conſequence; ſuch is that which is called *Trichiſmos* and *Regma*, which has but a very ſmall Orifice, but ſometimes are much more dangerous than the large Wounds.

Secondly, from the Part, which muſt be underſtood either in general of the whole Body, as the Age, Temperature, and Strength; or elſe in particular, to wit, of that Part where the Wound is received: As for Inſtance; it is more dangerous in the anterior Part than in the poſterior, becauſe the Bones are ſmaller in the fore Part, and thicker behind. Thus the Fracture in the Temple-Bones is ſtill more dangerous, by Reaſon of the Fineneſs of theſe Bones, and the *Muſculus Crotaphites*, which is very ſubject to Convulſions. It is alſo very dangerous on the Top of the Head, near the *Fontanella*, becauſe the Bone is exceeding thin there, and the Blow exerts its Force directly upon it; upon the *Sinus Superciliaris*, by Reaſon of the mucilaginous Liquor which flows out thence; and moſt of all upon the Sutures, becauſe here the ſmall Fibres are torn aſunder, as well as the Veſſels which paſs to

and fro thereabouts, to keep a Communication betwixt that Part and the *Dura Mater*, which produces a ſetrling of the Blood there.

Thirdly, from the Symptoms, which are either *univerſal*, as a Fever, a Frenzy, Convulſions, and a Palſey; or elſe *particular*, and theſe again are either good Symptoms, as a ſmall Tumour, a well-colour'd red Fleſh, a laudable Suppuration; or elſe ill Symptoms, as a livid or blackiſh Colour, a Contuſion of the Fleſh, or of the Bone, a ſanious Matter, a viſcous Conſiſtency and Inequality of the Bone.

After the Chirurgeon has made his beſt Obſervations upon all thoſe Things I have mentioned, it is Time for him to come to the prognoſtical Part; but in this Point he muſt proceed with much Caution, and not be poſitive in his Judgment, eſpecially in the Wounds of the Head; for among theſe there are ſome that ſeem to be but ſlight Wounds at Firſt Appearance, but in the End bring the poor Patient to his Grave. He muſt therefore act with Caution, and not neglect to let Blood plentifully, to prevent the Extravaſation of the Blood in the Brain; for I would not have him do, as a certain Chirurgeon of a Perſon of Quality of our Court did with the Lieutenant of the King's Hundred *Swiſs*, which having received a great Contuſion on the Head when he was abroad a Hunting, the Blood was coagulated, produced an Ulcer, and he died in Forty Days Time, becauſe the Chirurgeon would not let him Blood.

'Tis a vulgar Error to imagine, that after the Forty Days are paſt, all the Danger is over. 'Tis true, that at the Expiration of this Term there is ſome Room for to hope the beſt; but as there are a great Number of thoſe that have died of their Wounds after that Time, you muſt not be too poſitive in your Judgment.

If the wounded Perſon happens to commit any Exceſs in Wine or Women; if he expoſes his Perſon to exceſſive Heats or Colds; if he is of a weakly Conſtitution; if his Pulſe does not beat as it uſed to do; or if he is careleſs of his own Perſon; there is ſtill ſome Danger after the Sixtieth Day.

I know the Lawyers take it for a conſtant Rule among themſelves, That the Danger is paſt in Forty Days; and that if the wounded Perſon does die after that Time, it is not to be attributed to his Wound. 'Twas abſolutely requiſite there ſhould be a certain Term prefixed, according to which, the Judges were either to condemn or abſolve a Perſon that had wounded another; but this is no Rule to a Chirurgeon, who in Point of Prudence ought not to pretend to be anſwerable for the Patient's Life till after the Hundredth Day.

The Cure of the Wounds of the Head, provided the Skull is not touched, do not differ from thoſe of the other Parts, unleſs it be in ſome few Circumſtances, which muſt not be neglected.

Firſt, above all other Things, you muſt cut off the Hairs; and to do it with the leſs Pain, you may wet them with Water and Oil mixed together, which is called *Hydroleum*, and take Care that no Hair may fall into the Wound; but if this cannot be prevented, you muſt waſh it with warm Wine before you dreſs it.

Secondly, Care muſt be take to defend the Wounds of the Head much more againſt the Cold, than in any of the other Wounds, becauſe it is a great Enemy to the Brain, and therefore you muſt take Care not to apply any Thing that is actually cold.

Thirdly, at the Beginning you muſt let the Patient lie upon that Side that is oppoſite to the Wound, to prevent Fluxions and Pain; but afterwards, when the Inflammation is ceaſed, and the Suppuration appears, let him lie upon that Side where he is wounded, to facilitate the coming out of the Matter from the Wound.

Thoſe Wounds where the Skull is diſcovered, and thoſe where it diſcovers it ſelf by the Corruption of the *Pericranium*, that ſupervenes, muſt be managed like ſimple Wounds, provided the Bone be not affected. Thoſe that are cauſed by a Contuſion, will require a longer Time of Suppuration than thoſe that are made by Inciſion; and if the Bone is only a little diſcover'd, don't tamper too much with the Wound, but permit the Bone to recover it ſelf, which it will do ſometimes without an Abſceſs, eſpecially in Children. But if it is very much laid bare, you muſt expect the Exfoliation which will follow either ſooner or later accordin

according as the Temperament of the Patient is either more moiſt or more dry. Take care not to let any unctuous Matter touch the Bone, but apply to it only a Pledget dip'd in Spirit of Wine, mix'd with ſome Tincture of Aloes; or elſe you may convey unto the Bone a ſmall Quantity of the White Balſam of *Fioraventi.*

It does not happen at all Times that we are ſenſible of the Exfoliation of the Bone, *i. e.* we don't ſee a whole Lamel or Leaf of the Bone to ſeparate it ſelf at once; for ſometimes it is extended inſenſibly with the purulent Matter in ſmall imperceptible Pieces: But let it happen as it will, when you find the Fleſh ſettled to the Bone, you may then endeavour its Re-union with that of the Lips of the Wound, in order to bring it to a Cicatrize. When there are certain Signs that the Bone is affected, and that you judge it neceſſary to proceed to the Trepan, and you find the Wound not ſufficiently large to admit of the Trepan, you muſt make a Dilatation. Theſe Inciſions are made either of the Figure of an X, or of a T, or of an N, or of a 7, according to the Situation of the Wound.

The Inciſion which is made like an X, or Croſs, is commonly made upon the Middle of the *Os Coronale*, and the *Oſſa Parietalia.* When the Wound is near a Suture, you muſt make it like a T, but ſo as to ſhorten that Part which might ſtretch over the Suture; but at the ſame Time you may lengthen or extend further the oppoſite Part or Leg, in order to diſcover the Skull the better.

Thoſe that are made near the Temporal Muſcle, or the Sutures, are made in the Shape of a V, or a 7; but in general they muſt be adapted to the Figure and Situation of the Wound, which will not at all Times permit us to make the Inciſion as we will.

If there be no Wound; but at the ſame Time there appears a large Contuſion on the Head, cauſed by a violent Blow or Fall, and the Wounded has loſt his Senſes, bleeds at the Noſe, at the Mouth, or at the Ears, you muſt immediately open the Contuſion by an Inciſion made croſsways, which may be done with a Launcet, ſuch as is uſed for the Opening of Abſceſſes. If it is very high, and if you find the *Pericranium* ſeparated from the Skull, (after your Opening) 'tis a Sign that the Blow has been very violent; and that you muſt call the Trepan to your Aid: To be ſatisfied, you muſt make Uſe of a ſmall round Probe of Silver. But in caſe the Contuſion proves but very ſlight, and that there are no very urgent Symptoms, you muſt endeavour to diſſipate it, by ſhaving the Place, bathing it with Spirit of Wine, and applying upon it the *Emplaſtr. Betonic.* letting him Blood, and keeping him very quiet. By theſe Means 'tis often cured without making an Inciſion.

Whenever the Chirurgeon finds himſelf obliged to proceed to the Dilatation of a Wound, or to make an Inciſion in a Contuſion, he muſt be provided with good Store of Lint, with adſtringent Powders, as alſo with ſome Pieces of *Vitriol*, in caſe of an *Hemorrhage.*

Every Thing being in Readineſs for the intended Operation, he muſt take Care alſo of the Bed, *i. e.* you muſt lay a double or triple-folded Cloth under the Head, to receive the Blood that will flow from the Wound. This done, let your Servant hold it, whilſt you make the Inciſion as far as you judge it neceſſary, and with ſuch an Inſtrument as you think moſt ſuitable for your Purpoſe.

If there be a Wound ſo as that the Probe will run in betwixt the *Pericranium* and the Skull, you may convey the Points of your Sciſſars alſo the ſame Way, and thus diſcover it. After this he may make uſe of the ſtrait *Biſtoury*, and reſting his Finger called the *Index* upon the Back of this Inſtrument, make his Inciſion as far as the Skull; and afterwards, with the Inſtrument called the *Myrtle Leaf*, lift up the Edges of the Wound aſunder, and ſeparate the *Pericranium* with as little Violence and Pain as poſſibly may be; for ſuch-like Divulſions in the nervous Membranes muſt of Neceſſity be attended with moſt exquiſite Pains. After you have ſufficiently dilated the Wound, you muſt furniſh it with dry Lint only for the firſt Time, that it may the better imbibe and exhauſt the Blood that iſſues from thence. In caſe it bleeds vehemently, you muſt lay at the Bottom of the Wound large Tents to raiſe the Lips, and cover it with flat Pledgets dip'd in Adſtringents. Lay over theſe a large Plaiſter and Compreſſes, and over

all theſe apply the Bandage called the *Couverchef*, of which I have given you a Delineation in the firſt Demonſtration among the Bandages.

In caſe you have opened an Artery, from which flows Abundance of Blood quite thro' the Compreſſes and the Bandage, you muſt take off all again, and apply to that Part from whence you ſee the Blood come forth, a ſmall Piece of *Vitriol*: But after all, *Peræus* has put us in the beſt Way; to wit, to convey an incurvated Needle, with a waxed Thread underneath the Veſſel, which entring on one Side, and coming out at the other, ſo as that the Thread comes round the Artery, it is tied together in a Knot with the two Ends of the Thread upon a ſmall Linen Compreſs, which will inevitably ſtop the Flux of the Blood; and by this Means you avoid the *Eſcar* which the *Vitriol* will produce.

The next Day, or about Four and twenty Hours after (this being the ordinary Time when we take off the firſt Dreſſing) you will find the Bone diſcovered, and then it is Time to examine very well whether it is damnified or not; but be careful for Fear of a Miſtake; for when you made your Inciſion the Day before, 'tis poſſible that the Point of the *Biſtoury* may have left a Tract lengthwiſe in the Skull, which may reſemble unto a Cleft or Crack: You muſt alſo be very careful not to be miſtaken in the Sutures; which in ſome Subjects do ſeparate in two, the *Os Coronale*, in the ſame Manner as it does the *Os Occipitis*, which may perhaps be miſtaken for a Fracture.

If you meet with a Depreſſion, you muſt raiſe it up again; if it is a ſimple Crack, you muſt raſp it, according to ancient Practice. If there are ſome Splinters which prick the *Dura Mater*, they muſt be taken out. If ſome of them are pointed, and ſtand outwards, they muſt be cut off; and, if there is a Settling of the Blood, you muſt apply the Trepan.

I told you before, that the Skull ſuffered ſometimes a Depreſſion, by a Contuſion, which is called *Tlaſis*; and that in Children the Skull will ſpring up again into its natural Poſition. But in caſe it does not, and that this Depreſſion is but ſlight, and not attended with any ill Symptoms, the beſt Way is not to meddle with it, but to leave it to it ſelf, till the Patient is recovered, without any further ill Conſequences. But if it is a large and deep Depreſſion, ſo as to preſs upon the *Dura Mater* and the Brain, Care muſt be taken to lift it up again in Time.

For this Purpoſe, you muſt make a ſmall Hole in the Middle of the Bone, by the Help of the *Perforator* mark'd with I, unto which you muſt faſten the Inſtrument called the *Tireſonds*, mark'd with K, the Extremity of which is open; by the Means whereof you may pull from inwards outwards, and ſo endeavour to raiſe again the Depreſſion. If you can't accompliſh this Operation with your Hand, you muſt ſcrew another ſmall *Tireſonds* mark'd with L, to the Elavatory *Triploides*, mark'd with M, ſo called becauſe it is provided with Three Feet, which muſt be placed upon the Head, and then turning the *Viſſe* that is fix'd to its ſuperior Part, you may thus raiſe up again gradually the depreſſed Part. The Bones being reduced to their natural Evenneſs, you muſt remove the Elevatory and the *Tireſonds*, and dreſs the Wound in the ſame Manner as you do with thoſe where the Bone is only laid open, till its Conſolidation; unleſs ſome ill Symptoms ſhould intervene, which might oblige you to proceed to the Operation with the Trepan.

In former Ages, when they had diſcovered a Breack in the Skull, they uſed to apply the Raſp before they had Recourſe to the *Trepan*. This Operation was always applied to the hard Parts, and they did raſp as much of the Bone as they thought neceſſary. The Uſe of this Operation had ſo far prevailed with the Ancients, that they accounted the Raſps among the Inſtruments belonging to the Trepan. Some of theſe Raſps are pointed, ſome round, ſome real, ſome flat, of all which they made uſe by Turns: As for Inſtance, when they did meet with a Breack in the Skull, they began to raſp with the Raſp mark'd with N, and after that made uſe of the Oval marked with O; then with the Round marked with P, which goes deeper; and at laſt with the Pointed mark'd with Q, which went to the Bottom. They took Care from Time to Time to moiſten the Raſp with cold Water,

for

for fear it ſhould grow hot in rubbing againſt the Bone.

When they were come to the Bottom of the Crack, they uſed to apply ſome Cephalick Powders made of the *Ariſtolochy*, *Myrrhe*, and *Aloes*; and by this Means hoped to ſuperſede the Trepan. But now a-days we don't make Uſe of the *Raſp* in ſuch-like Caſes, becauſe there is always ſome coagulated Blood which is beyond the Reach of the *Raſp*, becauſe it lies under the *Dura Mater*, which can't be brought from thence but by the Help of the Trepan.

If after you have made the Inciſion you find there is an *Ecpieſma*, and that ſome of the broken Pieces preſs upon the *Dura Mater*, you muſt make it your Endeavour to lift or take them out, if they don't ſtick too faſt. You muſt lift them out by Means of theſe Three *Elevatories*; the firſt whereof, mark'd with *R*, is incurvated; the ſecond, with *S*, is flat; and the third, mark'd with T, is ſtrait; but only a little incurvated at the End: Or elſe you muſt take them out with theſe Pincers marked with V, which is made like the Beak of a *Raven*.

I remember I have ſeen Abundance of Pieces of Bones taken out, and when the *Dura Mater* has been laid open to the Breadth of half a Hand, and yet the Patient has recovered. But if there are ſome Bony Pieces which ſtick ſo faſt that they can't be brought out, you had better let them alone for ſome Time than uſe too much Violence.

I told you, that you muſt lift or take out the bony Pieces; but I ſuppoſed that you would take hold of them; for if not, 'tis better to apply the *Trepan* upon the ſound Bone, near the Fractures, and then ſlip an Elevatory into the Hole made by the Trepan; and thus to lift out the Pieces of Bones one after another.

When the Fracture proves to be an *Engiſſema*, where there are ſome Points of the Bone raiſed outwards, ſome adviſe to cut them with the Inciſion Sciſſars marked with X; and if theſe will not do, they will have you make uſe of the others mark'd with Y, which are made with a Screw, which will do it effectually, becauſe a Screw has much more Strength than a Hand. They have invented alſo a little Hammer marked with Z, the Head whereof is of Lead, and a Chiſſel made of Steel, and ſharp edged, mark'd with Δ: By which Means, they ſay, you may cut off the Piece of Bone as the Stone-cuters do a Stone.

But I don't approve either of the Pincers or of the Chiſſel, nor of the Hammer, becauſe if one Piece of the Bone ſtands outwards, the other will turn inwards, and ſo you may eaſily impair the *Dura Mater* in ſo rough an Operation. I did not mention it here, either to perſuade you to, or diſſuade you from it; but only to give you ſome Idea of this Operation, as it was practiſed by the Ancients.

Whenever there is an abſolute Occaſion for the *Trepaning* of a Fracture, it admits of no Delay; and as it is one of the moſt conſiderable among the Chirurgical Operations, a Chirurgeon can't be too circumſpect and exact in putting it in Execution.

All the Pains the Antients have taken in inventing their Raſps and the other Inſtruments we have ſpoken of juſt now, were deſigned for no other End than to avoid the Trepan; or at leaſt not to uſe it till at the utmoſt Extremity, which they would never apply, unleſs there appeared infallible Signs of a congealed Blood under the *Dura Mater*; and after having try'd all other Means to raiſe a Depreſſion, and to manage a Contuſion, *&c.* 'twas this that made them delay this Operation, till by certain Symptoms they were convinced of the indiſpenſable Neceſſity of it; but ſometimes it was ſo long before theſe Symptoms made their Appearance, that the Trepan comes too late.

But in our Time, ſince we have been better acquainted with the Uſe of the Trepan, we are for preventing theſe Symptoms, and 'tis ſufficient to have ſuch Indications as ſhew that ſuch-like Symptoms are likely to enſue: As for Inſtance, if a Man receives a Wound on the Head, that he falls to the Ground upon the Blow, without either Senſe or Motion, this is ſufficient to ſhew that there is ſome extravaſated Blood; and if you will ſtay till the Blood turns to an Abſceſs, and diſcovers it ſelf to be thus by a Feaver, Pain in the Head, Drowſineſs, *&c.* then, I ſay, tho' the Trepan may open a Paſſage for the purulent Matter to come forth, the evil Impreſ-

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ſions and Diſorders it has cauſed there by its long Continuance, cannot be repaired by this Operation, and ſo the Patient is loſt.

I tell you this, to encourage you to this Operation, and to make you ſenſible, that Time is precious in ſuch-like Caſes, and muſt be made Uſe of to the beſt Advantage.

A young Lord being abroad a Hunting with the Duke of *Burgundy*, fell from his Horſe, and received a great Contuſion upon one of the *Oſſa Parietalia*, which was fractur'd. I made an Inciſion croſsways, and applied the Trepan; all which was done within Four and twenty Hours. He was ſo much ſtunn'd and ſtupified by the Fall, that he was not ſenſible that the Trepan had been applied; and as this made me ſuſpect that there muſt be ſome coagulated Blood in the Head, I found abundance of it. If in this Caſe I had delayed the Operation, till by the enſuing Symptoms I had been fully confirm'd in my Judgment, I am afraid the Event would not have proved ſo fortunate as now it did. I am of Opinion, That it is more proper, even in dubious Caſes, to make Uſe of the Trepan, becauſe this Operation moſt commonly is not attended with any ſiniſter Accidents; whereas if it be delayed too long, your Life is gone.

The Trepan is derived from the *Greek* Word *Trepanein*, which ſignifies to turn; is a Chirurgical Operation which is applied to the hard Parts, by the Means of an Inſtrument made in the Nature of a *round Saw*, which is turned, in order to take out a Piece of the Skull; this being the Part unto which the Trepan and its Operation is only adapted. Some Authors there are which will have it applied alſo to the *Sternum*, and to the Ribs. I have ſeen it made Uſe of upon the *Sternum*, but the Patient died. I never ſaw it applied to the Ribs; nor can I conceive how it can, without breaking ſuch thin Bones as theſe in Pieces: And 'tis for this Reaſon that I reſerve it only for the Head, where its Application has delivered a great Number from the Grave.

However, the Trepan is not uſed with equal Succeſs in all Places. At *Avignon* and *Rome* they prove very ſucceſsful. 'Tis the ſame at *Paris*; and ſtill more at *Verſailles*: But very few eſcape in the Hoſpital *De Dieu* at *Paris*, by reaſon of the Infection of the Air, which putrifies the *Dura Mater*.

All the Authors conſent in this, That there are Six Places where the Trepan is not to be applied. Firſt, to the Fontanel of the Head in Children, becauſe the Bone has not Solidity enough to bear it. *Secondly*, to the Sutures, becauſe they give Paſſage to many Veſſels, which have a Communication with the *Dura Mater* and the *Diploe*. *Thirdly*, upon the *Sinus Superciliares*, becauſe a certain Humour is filtrated through their Cavities, which would render the Wound incurable. *Fourthly*, on the Temples, partly by Reaſon of the Temporal Muſcle, partly becauſe theſe Bones being articulated together in the Nature of Scales, that Piece of the Bone which is to be taken out would break in Two. *Fifthly*, on the Declivities or inferior Parts of the Head, becauſe the Brain being in continual Motion, would preſs the *Dura Mater* outwards. *Sixthly*, upon the great Openings, becauſe theſe Bones being not very firm, they would not bear the Trepans without being preſs'd inwards upon the *Dura Mater*.

Theſe are very rational Precautions; but after all, when Danger is at Hand, we muſt not be too ſcrupulous in theſe Points, and rather to run ſome Hazard, than to let the Patient periſh: But take Care at all Times to keep at ſuch a Diſtance from them, as the Figure and Situation of the Wound will poſſibly admit of; all which muſt be left to the Diſcretion of the Chirurgeon.

There are Two Times for all the Chirurgical Operations, to wit, one of Neceſſity, and the other of Choice; but in this there is no Time of Choice, unleſs it be for a few Hours; for the Intention of the Trepan is to prevent thoſe Symptoms which may befall the Patient every Moment, and therefore no Time is to be loſt.

I would not adviſe you to make Uſe of the *exfoliating Trepan*, becauſe this Way of taking ſeveral Lamels off one after another, muſt of Neceſſity ſhake the Head too much, and do more Harm than Good. At its Middle it has a Point, which keeps it from entring too deep; but notwithſtanding this, it is apt to wound the *Dura Mater*, becauſe it cannot be taken out ſo well as the com-

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mon Trepan. I am not the Firſt that rejects the Uſe of this Inſtrument, which has been condemned before me: However, I have given you a Delineation of it in the XXXIſt Figure, that you may be the better convinced of its Defects.

There are Three Crowns belonging to the Trepan, one ſmall, the other of a middle Size, and the third the biggeſt. Now the Queſtion is, Which of theſe Three ought to be made Uſe of, and what Quantity of the Bone is to be taken out? They tell us, That generally ſpeaking the leaſt is the beſt, becauſe we ought not to lay open any more of the Brain than what is impoſſible to be avoided; and a large Opening is harder to be cured: Nevertheleſs there are certain Caſes where the biggeſt Crown is the moſt commodious: As for Inſtance; when there are Two Cracks or Clefts, and the large Crown can encompaſs both of them at once, which is better than to make Two Trepans with the little Trepan.

As to the Places where the Trepan may be applied, this muſt be, generally ſpeaking, always at the Place where the Blow is given; but in particular, there are certain Circumſtances which muſt not be neglected.

Firſt, if the Wound is on the upper Part of the Head, you muſt apply it to the lowermoſt Part of the Wound, to facilitate the iſſuing of the Blood and Matter; but if it is on the lower Parts, you muſt apply the Trepan to its uppermoſt, to keep at a Diſtance from the Brain.

Secondly, if it be a Crack, he muſt not fix the Trepan upon the Middle of it, nor far from it, but the Teeth of the Crown muſt be upon the Crack, that when the Bone exfoliates, the oſſeous Pieces may be the eaſier ſeparated.

Thirdly, in a great Contuſion, which cannot be managed by the *Tirefonds* and the Elevatory *Tripoides*, you muſt apply the Trepan to the Middle of the Depreſſion, that ſo you may put the Elevatory into the Hole, and raiſe it up again into its Place.

Fourthly, even though a Contuſion is but ſlight, and without a Crack, and though it appears only as if it were made with a Hammer upon a Piece of Wood, you muſt not neglect to trepan the Patient, becauſe the Fibres of the Bone are diſunited; and you muſt accompliſh your Operation upon the Place where the Contuſion is.

Fifthly, when you meet with an *Ecpieſme*, where many oſſeous Fragments do preſs upon and diſturb the interior Membranes, you muſt fix you Trepan upon the next adjacent Bone, which muſt be ſolid and ſtable, to be able to ſuſtain the Efforts made upon it by the Trepan, to facilitate the taking out or lifting up of theſe Fragments.

Sixthly, in the *Egiſſoma*, and the *Camaroſis*, you muſt alſo fix the Trepan to the adjacent Part, in order to facilitate afterwards the Reſtitution of the Bone into ſuch a Poſition, as may not prove incommodious to the *Dura Mater*.

The Operation of the Trepan being, after mature Deliberation, reſolved upon, the Chirurgeon muſt prepare every Thing, as well thoſe that are to precede the Operation, as thoſe that belong actually to its Execution, and after its Operation.

Before he enters upon the Operation, he muſt, if poſſible, lodge his Patient in a Room where he is not diſturbed by the leaſt Noiſe; and the Windows ought to be provided with double Shutters, to keep out the cold Air and the Wind; and the Room ought to be moderately big. The Chirurgeon muſt have his Inſtruments ready in Two Baſons, One whereof ought to contain the Inſtruments he ſtands in need of during the Operation; and the Second, what is required for the Dreſſing after the Operation. The Firſt is repreſented in N° II. and the other in N° III.

Certain

Certain Directions for the Uſe of the TREPAN *in the Fractures of the Skull. Taken out of Monſieur* Dionis's *Courſe of Chirurgical Operations. Done from the Original newly printed at* Paris.

THE Firſt Thing to be taken Care of, is to have the Inſtruments that are neceſſary for this Operation in a Readineſs beforehand. This I would have done in an adjacent Room, where you may diſpoſe of them in due Order, either in a Baſon or in a Diſh, covered with a white Cloth or Napkin, over which you muſt ſpread another Linen Cloth, before it is carried into the Room where the wounded Perſon is, that ſo he may not be ſurpriz'd and frighten'd at the Sight of them at once.

Then you muſt place your Patient in a convenient Situation, *i. e.* you muſt ſo order the Head, as that the Wound may appear uppermoſt, that ſo you may be able to apply the Trepan directly to and upon it. The Bed muſt be fixed in the Middle of the Room, that your Aſſiſtant or Servant may without any Impediment go behind it, to keep the Patient's Head ſteady and firm, or elſe that the Chirurgeon himſelf may take his Place on that Side, in caſe he judges it moſt convenient for his Purpoſe. The Head of the Patient muſt be laid upon a ſmall Pillow, and under that a little Board, to keep it the more firm, and from ſinking downwards during the Operation.

The Chirurgeon, in caſe he wears his own Hair, muſt have them tied behind the Head with a Riband; or if he uſes a Periwig, let him throw it by, and put a ſmall Cap upon his Head, for fear the Hairs ſhould fall before his Eyes whilſt he is ſtooping with his Head downwards during the Trepan. Let ſome Body hold in the Middle of the Bed a Chafing-diſh with Fire, *B.* and let another light the Chirurgeon by the Help of the Two ſmall Wax Tapers, *A.* join'd and twiſted together; for the Operator ſtanding in Need of a ſteady, clear, and well-united Light, theſe Wax Tapers are more proper for his Purpoſe than any others, becauſe they will eaſily bend and twiſt together; and beſides this, may be drawn back and forwards, and conſequently at a greater or leſſer Diſtance from the Operator, according as Occaſion ſhall require.

Things being thus prepared, you muſt well examine the Wound, and cleanſe it with the falſe Tent of Lint, mark'd with *C.* And to cauſe as little Pain as poſſibly may be to the wounded Perſon, you may ſtop up his Ears with Two ſmall Balls, *D, D,* made either of Cotton or of Lint. I am apt to believe, that the Noiſe which we obſerve in the Ears when they are ſhut up on the Outſide, does prevent the Noiſe which is made by the Crown of the Trepan whilſt it is penetrating into the Skull, from being perceived within the Ear: But I have known many Chirurgeons that never ſtand upon this Ceremony, and no Danger or Harm has enſued upon the Omiſſion of it.

If the Lips of the Wound are not high enough, and that they are in Danger of being touch'd by the Teeth of the Crown of the Trepan, you muſt raiſe and part them at ſome Diſtance one from the other by the Means of Four ſmall Bands, mark'd with *E, E, E, E.* Theſe muſt be drawn underneath the Lips, and their Ends held by him that holds the Head, or by ſome other Aſſiſtant which will keep them aſunder. But in caſe you find the Wound ſufficiently dilated, and of ſuch a Bigneſs, as that the Lips are not in any Danger of being touch'd by the Inſtrument, you need not trouble your ſelves about the ſmall Bands, but without any further Loſs of Time diſpoſe your ſelf to begin the Operation with the Trepan.

In this Operation of the Trepan, there are ſtill ſome more eſſential Circumſtances to be obſerved, than what we have related to you juſt now.

The Firſt Thing to be done here is, for the Chirurgeon to make Choice of the *Crown* of the Trepan, ſuch as he finds moſt ſuitable to his preſent Purpoſe; for, as we had Occaſion to tell you before, they are of Three different Sizes; one mark'd with *F,* being

the largeſt; that with *G*, of a middle Size; and laſtly, the ſmalleſt of the Three, which is mark'd with *H*. After he has pitch'd upon any one of theſe Three, ſuch as he judges moſt ſuitable to the Nature and the Figure of the Wound, he muſt take and fix it upon the Place where he has reſolved to apply it; but at the ſame Time be very careful that it may not touch upon the Lips of the Wound of the *Pericranium*, (which would cauſe a moſt exquiſite Pain to the poor Patient in the Operation) and then make One or Two Turns with this *Crown*, in order to mark the Circumference where the Trepan is to end, and to know the Middle of it exactly.

This done, he muſt take the Gimlet, mark'd with *I*, and upon that mount the *Perforator*, *K*, and fix it moſt exactly within the Place traced out or marked by the Point of the Pyramid that was within the *Crown*, and then turning the Inſtrument Five or Six Times, he muſt make a ſmall Hole of about the Depth of half a Line, which will ſerve to lodge the Point of this Pyramid within it, and to guide and keep the *Crown* ſteady, ſo that it cannot ſtir either one Way or the other.

The Perforator being taken out of the Gimlet again, you muſt in lieu thereof put into it the Crown of the Trepan you have pitch'd upon for this Operation, mark'd with *G* here. This you muſt apply to the Place which you have mark'd out before, holding the Handle of the Gimlet with your Left Hand, and leaning or putting your Forehead againſt it, and then turn it with your Right Hand from the Side that is oppoſite to the Teeth of the Saw, to make them cut the Bone.

He muſt at firſt turn the Inſtrument but gently, till the Crown has penetrated a little Way into the Bone, when he may go on ſomewhat faſter, becauſe there is nothing to be feared at that Time.

'Tis impoſſible to preſcribe you any exact Rules how ſtrongly you muſt lean upon the Inſtrument; this muſt be left to the Diſcretion of him that performs the Operation; for if he leans too hard againſt it, it will not turn without Difficulty; but if he does not preſs upon it ſufficiently, it will not penetrate into the Bone: But whatever you do, turn the Inſtrument with an even Hand, and without ſhaking; and when you think you have gone in about the Depth of a Line, you muſt take out the *Crown*, and take the *Pyramid*, mark'd with *L*, out of it, with the Inſtrument mark'd with *M*, becauſe it is now uſeleſs, becauſe the Hole or Impreſſion made by the *Crown* is in it ſelf ſufficient to guide it quite through, without the Help of this Pyramid, which if you ſhould neglect to take out in Time, might (not without great Danger) wound the *Dura Mater*.

The Pyramid being taken out, you fix the *Crown* again into the Depth, or the Impreſſion; and then you muſt continue to turn it till you come to the *Liploe*, which you may find by what is ſawed off, which appears of a reddiſh Colour, and by the Blood which often follows. When you ſee this, you muſt withdraw the *Crown*, and clean it from the Saw-duſt of the Bone and the Blood with the Bruſhes, mark'd with *N*, and before you put it in again, you muſt preſent the *Tirefond*, or Piercer, *O*, to make it prepare a Place in the Hole made by the Pyramid, in order by this Means to take out the Pieces of Bones, after it has been bored or ſawed out as much as ſhall be thought neceſſary.

After you have taken out the Tirefond, you muſt again apply the *Crown*; and you muſt turn it more leiſurely, becauſe the Second *Lamina* of the Skull is ſometimes much thinner than the Firſt. You muſt often lift out the *Crown*, to make it clean. You muſt probe the Circumference made by the *Crown* with the Plume, mark'd with *P*, and cut like a Toothpicker, to diſcover whether the Depth is made equal, that ſo you may bend or lean your Inſtrument to that Side where the Bone is leaſt cut. To be ſhort, you muſt continue to proceed in this Manner, to lift out the *Crown*, to make it clean, to take out the Piece with the Elevatory, *Q*, or with the Tirefonds, and to ſound the Opening or Depth as often as you think it requiſite, till your Inſtrument has penetrated quite through the Skull. When the Piece of the Bone will not hold any longer, you muſt take it out with the Inſtrument call'd the *Mirtle-Leaf*, mark'd with *R*, and if you perceive any Inequalities at the Bottom of

the Circle, which might either prick or incommode the *Dura Mater* in its Motions, you muſt cut them off with the lenticular Penkniſe, mark'd with *S*, which muſt be turn'd round about in the Circle, becauſe the *Lentil* which is at the End of it, prevents its wounding the Membranes.

By this Time you will ſee the Blood ſpring forth, and fill up the Hole, to ſpout out by the Pulſations of the Brain, and of the *Dura Mater.* Some have a Cuſtom to keep cloſe the Noſtrils of the wounded Perſon, to make him hold his Breath, and to puſh back with the Lenticular, mark'd with *T*, the *Dura Mater* upon the Brain, to facilitate the Iſſue of the Blood. But in caſe this Humour comes forth of it ſelf, as it often happens, you may very well ſupercede to diſturb the wounded Perſon with theſe ſlender Helps, and not to make a Compreſſion with the *Lenticular*; but take particular Care, before you proceed to the Dreſſing of the Wound, to abſorbe, by the Means of the *falſe Tent*, mark'd with *V*, the Blood that may be coagulated there.

It would be an Error in the Operation, if the Chirurgeon ſhould pretend to take out the Piece of the Bone in the Cavity of the *Crown*, when it is to be taken out, becauſe the Aſſiſtants would be apt to imagine, that he had gone further than he ought to have done, and that the Teeth of the Inſtrument had impaired the *Dura Mater*, though this is an Accident that very rarely happens, unleſs the Operator is ſo ſtupid, as to turn on beyond Reaſon; for the *Crown* being made like a Pyramid, the Point whereof is turned from the outſide inwards, it cannot fall upon the *Dura Muter* immediately after the Skull is cut through, becauſe it is ſtop'd by its largeſt Part; ſo that though this is not a very conſiderable Error, I would have a Chirurgeon avoid it, for fear of expoſing himſelf and his Reputation to the Cenſure of the Spectators.

The Firſt Table of the Bone may riſe upwards before the Second is cut. This, tho' it often happens, is none of the Chirurgeon's Fault, yet the Blame is moſt frequently laid at his Door; and therefore it behoves him ſo to manage his Point, as not to give Occaſion for any Reproaches, it being very well known, that when ſuch-like Operations of Moment are to be undertaken, there will not be wanting ſuch Perſons among the Spectators, as will not fail to paſs the moſt rigid Cenſures upon every Thing, if there be never ſo little Room for them.

The beſt Method in this Operation is not to act with Precipitation, for fear of impairing the Membranes and the Brain; but on the other Hand you muſt avoid being too ſlow, and to tire out the Patience both of the wounded Perſon and of the Spectators; the middle Way is the ſafeſt and beſt: All which depends on the good Conduct and Dexterity of the Chirurgeon.

If you meet with ſeveral Cracks or Fractures, you muſt make Two, Three, or Four Trepannations, and ſometimes more, if Neceſſity does require it.

A Girl of about Eleven or Twelve Years of Age, happened in the Year 1705, to fall down a Pair of Stairs. The Fall was ſo violent, as to crack the whole *Os Parietale*, with Part of the *Os Temporum*. Monſieur *Mareſhal* did the next Day trepan her in Two Places, and then cauſed a Third to be applied by his Son, and a Fourth by my Son, who was preſent at the Operations. The next following Day he applied Two other Trepans, and after that ſucceſſively no leſs than Twelve Times in all; notwithſtanding which ſhe was perfectly well cured. I could not forbear to inſert this Inſtance, which may convince the World, that there is nothing that is ſurpriſing in the often reiterated Trepannations in the ſame Perſon.

Of the Management or Dreſſing of the Trepan.

AFter you have performed the Operation of the *Trepan*, there is no Occaſion for you to ſtay till all the coagulated Blood is come out; 'tis ſufficient that it has now Vent and Liberty given it to evacuate it ſelf every Moment by the Way of the Hole or Aperture that has been made. You muſt take Care to clear or take away what is left in the Hole, by Means of the falſe Tents made of Lint, and mark'd with *A*, *A*, and if you

perceive

perceive that there is remaining ſome ſmall Point or Inequality in the Circumference of the Hole, which may cut or prick the *Dura Mater*, you muſt cut it off with the lenticular Penknife, mark'd with *B*, which done, you may proceed to the Dreſſing of the wounded Perſon.

The Firſt Thing you have to do, is to convey a few Drops of the *white Balſam* upon the *Dura Mater*, which is contained in a Viol, mark'd with *C*. Then you muſt warm a little of the *Mel Roſatum* in a Spoon, mark'd with *D*, and after you have mix'd it well together with a little of the *white Balſam*, dip into it Two *Sindons*, one of which is of Linen, mark'd with *E*, and the other of Lint, mark'd *F*. The Firſt of theſe Two is laid upon the *Dura Mater*; and as it is larger than the Hole that is made in the Skull, you muſt bring or convey it by the Means of the Lenticular, mark'd with *G*, all round its Circumference, betwixt the Skull and the Membrane. After this you put on the Second, and afterwards you muſt fill up the Hole made by the Trepan with the Tent made of Lint, and mark'd with *H*. Then you cover with the Pledgit, mark'd with *I*, that Part of the Skull that lies open, after having let it be well imbibed with Spirit of Wine. Then you muſt with the Pinchers, mark'd with *K*, take the Four ſmall Pledgits, mark'd with *L*, *L*, *L*, *L*, and after you have dipped them in the Digeſtive, mark'd with *M*, apply them one after another under the Four Lips of the Wound, the Middle betwixt which you muſt fill up with Two other ſmall Pledgits, mark'd with *N*, *N*, which muſt alſo be dipp'd beforehand in the ſame Digeſtive. This done, you muſt with the *Spatula*, mark'd with *O*, cover the Two large Pledgits, mark'd with *P*, *P*, with the Digeſtive likewiſe, and then apply or put them over all the reſt, and then make a Fomentation of the *Oleum Roſatum*, which is contained upon a Piece of Board, mark'd with *Q*, which you muſt hold near unto the Fire, to render it the more fluid, before you anoint or foment all the Part that ſurrounds the Wound. Over this you muſt apply the *Empl. de Betonica*, mark'd with *R*, and over this again the Compreſs, mark'd with *S*, and upon this a Napkin, mark'd with *T*, and over all this you muſt apply the Bandage, call'd the *Couvrechief*, ſuch as I have deſcribed to you before.

I am accuſtomed in my own Practice in theſe Caſes to add to all this Furniture or Implements a Woollen Cap, mark'd with *V*, which I put over the Bandages; for there being no more than Two double Linen Cloths upon the Head, this tender Part is by them not ſufficiently defended againſt the Cold; for the Hairs being taken off by the Razor, it is the more ſenſible of the Cold: And for this Reaſon it is that I judge ſuch a Thing as a Bonnet or Cap highly neceſſary, to keep that Part very warm. After all, you muſt put it in a convenient Situation: The moſt convenient for the wounded Perſon is, to repoſe upon the Wound, which Poſition will be aiding the Brain, by its Inclination to evacuate or puſh outwards whatever may prove incommodious to it ſelf, or to the Wound.

After you have finiſhed the Dreſſing of the wounded Perſon, you muſt above all Things recommend Quietneſs and Repoſe to him, and not allow him even to ſpeak; and about Two or Three Hours after the Operation is well over, you muſt return again, and adminiſter Phlebotomy to him. As to his Nouriſhment, you muſt order him no other than Broth, to be taken every Four Hours, and for his Drink, nothing but a *Ptiſan*, of which he may take as much as he will betwixt Times.

The next Day, before you take off the Dreſſing of the Wound, take Care to draw cloſe the Curtains of the Bed, and keep in the Middle of it a Chafing-diſh fill'd up with well-lighted Charcoal, ſo that they may not be obnoxious to the Head. This is done partly to purify or rarify the Air which in the Dreſſing will touch upon the *Dura Mater*; partly for the Conveniency of warming the Remedies, and the Linen Implements that are neceſſary for the Dreſſing. Take Heed not to leave the Brain uncovered; and 'tis upon this Account that you muſt have a new *Sindon* juſt ready at Hand, to put upon it before you take off that which was laid upon it before: Neither need you be very ſolicitous in ſpending much Time in ſetting the Lips of the Wound

to rights, but diſpatch every Thing with all poſſible Speed, the ſooner the better, which will ſave abundance of Pain to the wounded Perſon.

'Tis not to be expected we ſhould enter upon a particular Account how a Chirurgeon ſhould manage himſelf in this Cure, becauſe that muſt be left to him who undertakes it. 'Tis he that ought to underſtand the Subject he is to work upon, that he may be able to manage him according to the Condition he finds him in: But above all Things to keep exactly to the Regulation of his Diet, which muſt not be ſet aſide; for if you allow but never ſo little Liberty to the Patient, he is too apt to take a much greater Latitude; and as a good Appetite is a very good Sign in them, you muſt keep them for a conſiderable Time in that Condition.

Oily and ſtinking Remedies are good for nothing in the Wounds of the Head; but thoſe that are ſpirituous and balſamick are very efficacious. 'Tis upon this Account that we make Uſe of the *white Balſam*, of the Spirit of Wine; and the Digeſtive muſt be animated; and after all, we do not make Uſe of it for any conſiderable Time. Your Compreſſes muſt be dipp'd in Wine, in which you have boil'd beforehand all Sorts of Aromaticks, excepting Roſes, the Smell whereof may be offenſive to the Head. If the *Dura Mater* remains within its Bounds, you muſt ſtick to the ſame Way of Dreſſing; but if it comes forth through the Hole of the Trepan, you muſt take Care to keep it from entring into it: This muſt be effected by filling up the ſaid Hole with ſmall Tents.

Sometimes it happens that a fungous Subſtance like Muſhroons do appear, which ariſe from the *Dura Mater*. If they happen to be very large, you muſt either cut them, or tie them near the Bottom, till they become dry, and then they will fall off of themſelves. If they are very ſmall, you may take them away, or conſume them with the Powder of *Ocre*, or of *Hermodactyles* burnt to Aſhes.

Sometimes the Lips of the Wound will grow ſo faſt, that they cover the Aperture or Hole made by the *Trepan*. In this Caſe you muſt keep them back by Means of Pledgits dipp'd in *Aqua Vitæ*, or in the *Vulnerary Water*: For the reſt, you muſt ceaſe now to make Uſe of Unguents, and keep to the exſiccative Medicines, whilſt you are obliged to expect and ſtay for the Time of the Exfoliation.

For it is to be obſerved, that the Bones do exfoliate ſometimes ſooner, ſometimes later. This depends on the Age, the Largeneſs of the Fracture, and the Hardneſs of the Bone; but moſt commonly the Exfoliation happens betwixt the Fortieth and the Fiftieth Day.

The Uſe of Cephalick Powders is in vain to further the Exfoliation of the Bones; for this being meerly a Work of Nature, muſt be expected and ſtay'd for with Patience, for fear, inſtead of furthering it, they may ſerve only to diſturb and check the Courſe Nature has chalked out to attain its End.

The whole Circumference of the Hole made by the *Crown* of the *Trepan*, and every Part of the Surface of the Skull, as far as it is uncovered, will ſuffer an Exfoliation, which comes or falls off ſometimes in one whole Piece, not unlike unto a Ring, and ſometimes in more, which come off in Proportion as the Fleſh that is produced underneath does puſh or force them outwards. You muſt not be too haſty in this Point, and endeavour, for want of ſufficient Patience, to pull out theſe Pieces, notwithſtanding they are looſe; for this will not ſerve in the leaſt to advance the Cure, but may, on the contrary, prove an Impediment to it.

When the Exfoliation is quite over, as well in the Skull as the *Dura Mater*, (for this will alſo exfoliate or peel off like the reſt of the Membranes) there ariſes from thence a Fleſh, which acts in Conjunction with that which is produced by the Skull, and that of the Lips of the Wound; I ſay, all theſe Three new Fleſhes do produce a Kind of a *Callus*, which ſhutting up the Hole of the Trepan, reimplaces the Bone that was taken out; over all which is produced a Cicatrization, which is the Seal of the Cure.

A

A remarkable Caſe of an uncommon Fracture and Depreſſion of the Skull, in a Child about Six Years old, accompanied with a large Abſceſs or Apoſtheme upon the Brain. Abſtracted from Daniel Turner, *Surgeon.*

ON the 24th of *February*, 1709. I was call'd in Haſt to this Child, who was juſt then brought out of *Moorfields*, wounded by a *Catſtick* upon the Head: Examining of which, I perceived a ſmall Wound on the Right Side, which bled freely; and laying my Fingers hard upon the Part, under a Sort of Quagmire of grumous Blood, I found there muſt be a conſiderable Depreſſion of that Part of the Skull.

Whilſt I was delivering my Prognoſtick of the Child's great Danger, and telling his Friends of the Neceſſity there was to make Way to the Fracture, by removing ſome Part of the Scalp, the Boy began to cry, and fell a Vomiting. Having no Aſſiſtant with me, I contented my ſelf at that Time with a common Dreſſing, taking Six Ounces of Blood, and applying a Defenſative over that Part of the Head which was injured, till Evening, when I found the Child perfectly ſenſible, but complaining of his *Head-Ach*, and throwing up all he took. I ordered him a Cephalick *Julep*; and the next Day call'd in Mr. *Blundel*, who viſiting together with me, we found the Child had been hot and reſtleſs all Night, his retching to vomit having left him. When we had taken him out of Bed, I took off the Bandage and Dreſſings; and paſſing a Probe into the Wound, plainly felt the *Cranium* for a great Compaſs denudated of its Covering.

I began to draw a ſemicircular Line on the Outſide of the Depreſſion, as a Direction for my Knife, and another perpendicular, from the one Point to the other, that we might feel the Extent of the Fracture, before we removed any more of the *Scalp*. Then whilſt Mr. *Blundel* kept the Head ſteady, I cut through the half Circle to the *Cranium*, and found I was juſt beyond the Edge of the fractured Bone; but drawing my Knife upon the ſtreight Line, it ſlipp'd in a conſiderable Diſtance from the Superficies unawares; which Mr. *Blundel* perceiving, I withdrew the ſame to make Way for his Finger, by which he diſcovered ſo great a Vacuity, that we concluded the Bones were beat through both *Meninges* into the Subſtance of the Brain.

Upon this he approved of my making another Semicircle, and taking off the *Scalp* on the oppoſite Side, by which we might have the whole Fracture in View. Accordingly I diſpatched the Work, and took from the *Scalp* a Circle of the Size of a Crown-Piece, when immediately we diſcovered this vaſt Fracture and Depreſſion, exactly enough delineated in N° IV. of the Table, of Four Angles, ſunk ſo low beneath the Surface of the other Part of the *Cranium*, as to make a Cavity ſufficient to contain near Two Ounces of Liquor.

The outward Table was broke all round, whilſt the inward was only bow'd: Upon which Account there was no Room for an Elevator, or indeed any other Inſtrument, by which we could hope to raiſe up the depreſs'd Bones, without the Help of the *Trepan*. The *Terebra* was propos'd; but concluded inſufficient, as well as hazardous; inſufficient to liſt up the Bones, unleſs we could go quite through; and hazardous, by going through, of wounding the *Dura Mater*, which, if not lacerated by the prodigious Stretch, muſt needs bear tight againſt the Inſide of the *fractured Bone*. The *Trepan* in ſo young a Child was thought likewiſe to have its Danger, the *Membrane* in young Children lying high, and in a Manner continuous to the Inſide of the Skull.

However, here was no Room for long Delay, the foreſaid Part lying under being ſo much oppreſs'd by the Points of the Bones, through the Clefts of which we might perceive a manifeſt *Oſcillation*; yet for the preſent we could do nothing more, being diſturb'd in our Work by a Flux of Blood from an inciſed Artery, which I was obliged to ſtop. I viſited in the Evening, and found a quick Pulſe, *Thirſt*, and *Head-Ach*, eſpecially toward the Forehead, but no Vomiting. He was very ſenſible, and indeed bore up beyond Expectation; yet in Conſideration to the Diſturbance we had given to the whole Animal Oeconomy by that Morning's

ning's Work, I preſcribed him a compoſing Draught at Night, as a Preparative, to which a Clyſter was adminiſtred the ſame Evening, yet ſtill the Child ſlept but little, and that unquietly. Next Day I ordered him ſome *Antiepileptick Powders*, with a *Cephalick Julep*. The 27th I could plainly perceive the Extent of the *Fracture*, which lay all in View; and finding it would be fruitleſs to attempt the Reduction of the depreſs'd Bones to their proper Places, I reſolved to make Way for ſetting on the *Trepan*, which I concluded would be beſt done above the Fracture; which being ſeated on the Right *Bregma*, was bounded forwards by the *Coronal*, backwards by the *Lambdoide*, upwards by the *Sagittal*, and downwards by the *Squamous Suture*; and indeed ſo near to this latter, (as may be ſeen in the Figure) that there was not Room for the *Trepan* below. When I had drawn a Circle above, within a quarter of an Inch, or leſs, of the broken Edge, I took out a proportionate Piece of the Scalp, almoſt the Size of a mill'd Shilling, which my Patient never winch'd at; applying afterwards a large Pledgit of Liniment upon ſoft Tow over the Lips, and roll'd up his Head for that Day.

This Preparation being made for the Work, I went to Mr. Warden *Herenden*, ſtated the Caſe, and appointed a Conſultation the next Day, deſiring he would not fail me, that I might be juſtified in the Operation. Accordingly on the 28th, at the Hour appointed, he call'd on me: And when, upon Entrance into the Patient's Chamber, he found the Child on his Feet, walking about the Room, he ſeem'd amaz'd, as ready to ſurmiſe the Caſe had been miſtated, and that probably we might ſpare the Operation. I was not in the leaſt concern'd hereat, well knowing he would alter his Sentiments upon Sight of the Wound: Then taking off the Dreſſings, he ſeem'd aſtoniſh'd that a Child, under ſuch a violent Depreſſion of that noble Part, ſhould labour under no worſe Symptom than a *Head-Ach*, and be in a Condition to walk about. Pleas'd with the Child's Courage, he plac'd him againſt the Nurſe's Boſom, and took upon himſelf to keep his Head ſteady, whilſt I began to work with the *Trepan*; and obſerving that admirable Axiom, *Feſtina Lente*, I gently turn'd the Inſtrument, now and then taking it up to clean, till I had got to the *Diploe*; when lifting it out again, bruſhing off the Saw-Duſt, and laying the Pin aſide, I proceeded to work farther; examining with my Probe betwixt whiles where I was got through, and bearing down upon thoſe Parts where I found I was not.

In few Minutes the Work was diſpatch'd; and being willing to have it out as clear as I could, without having Occaſion to ſhiver off any Part that might remain undivided by the Saw, I thought to paſs gently a Turn more upon the adhering Side, and ſo remove my Inſtrument; when at firſt ſomewhat ſurpriz'd us, for we miſs'd the perforated Bone, and were ready to ſurmiſe, the *Membrane* being ſomewhere lacerated underneath, had let it in, and return'd by its own proper Elaſticity again to its Convexity; but looking into the Inſtrument, we found it in the Bore. I hint this as a *Memorandum* to be obſerved by the young Artiſt; for 'twas not truly my Intention to have taken it out ſo: Nor did I ſuſpect that one gentle Turn would have cut aſunder that Part, which juſt before did ſeem to ſtick too faſt to hazard the Breaking off.

The *Warden* was pleas'd however with the Operation. The Edges of the Bone were ſo exactly ſmooth and even, that we needed no Lenticular to come after for to poliſh the Work. The *Dura Mater* appear'd fair, though ſomewhat florid from its Inflammation: And now we immediately went about lifting up the depreſſed Bones; in order to which, paſſing carefully my *Elevator* through the Perforation, and heedfully obſerving that the *Membrane* might not ſlip between my Inſtrument and the fractur'd Bone I was about to raiſe, I began to lift, having placed the End of the ſaid Inſtrument under the Center of the largeſt and moſt likely of them; when bearing up with conſiderable Force, I found it would not ſtir: On which Account I drew back my Elevator; and arming its Shank with a ſoft Rag, placed alſo a Linen Bolſter upon that Part of the Edge of the Second *Cranium*, which was to be its *Fulchrum*. Being thus provided, I convey'd it in once more, and with redoubled Force perceived it began to

to give: Continuing the ſame Force, it immediately flew up, and ſhiver'd off the inner Table.

The Bone being extracted, our Work was much facilitated: Nor had we further Occaſion to paſs our Inſtrument through the Bore; for by ſhifting our *Fulcrum*, or reſting upon another Part, we could command the other Pieces at our Pleaſure. There had been a Debate the Day before betwixt Mr. *Blundel* and my ſelf, whether after extracting One or Two of the Bones, we ſhould not leave the Remainder, having raiſed them up to their Places, in Expectation that they might agglutinate or unite by the Intervention of a *Callus*; by which the *Dura Mater* would be defended from lying bare ſo large a Compaſs, and our Work ſhorten'd in Reſpect to the Cure, if ſuch a Thing might be accompliſhed. However, finding them all break upon their Elevation, and fearing ſome looſe Angles might irritate the *Membrane*, creating to us more and greater Diſturbance, it was now concluded they ſhould all be taken away, and very happily they were ſo, as appears by the Sequel.

Having removed theſe Four Pieces of Bones, of the exact Shape and Dimenſions with thoſe expreſs'd in the Figure, N° IV. the *Dura Mater* began to vibrate ſtrongly, and rais'd it ſelf at the ſame Inſtant, to fill up the ſurprizing Chaſm; which wiping gently with a ſoft Spunge, wrung out of a little warm *Claret*, I preſently covered that and the bored Part with ſuitable *Sindons* of white Sarſenet, dipp'd only in *Mel Roſarum*, continuing my dry Lint upon the Lips; and having laid the Digeſtive over all, I roll'd up his Head. After the Work was over, he was carried to Bed, being refreſh'd with Two or Three Spoonfuls of his *Cephalick Julep*. From this Day our Work ſeemingly went on with a proſperous Aſpect; the *Cephalalgy* much abated; the Pulſe grew calm, and the Child lively; and ſo continuing for Four or Five Days. The *Dura Mater*, both in the Place of the Perforation, as well as that where the Bones had been extracted, began to be beſprinkled with little Grains of Fleſh; only in the Midſt of this latter there appeared a Kind of Slough, occaſioned by the Points of the depreſs'd Bones, which by grating hard, had raz'd the outward *Membrane*; to digeſt and haſten the Separation of which, I dreſs'd thoſe Parts with a little of the *Balſam* of *Turpentine*, added to the *Mel Roſarum*.

No ſooner was this Part mundified, and a Sort of granulated Fleſh had cloathed the bare *Membrane*, but the *Head-Ach* return'd afreſh, with greater Extremity than ever the *Symptomatick Fever*, and Reſtleſneſs alſo accompanied: So that on the 5th of *March*, upon taking off the Bandage, I perceived there had been a much greater Diſcharge than could reaſonably be expected from the Outſide Wounds; and removing the Dreſſings, to apply a *Stupe*, wrung out of the Fomentation, I took Notice of an offenſive Smell; when looking carefully upon the *Membrane* through a ſmall *Papilla*, or Grain of the new incarnated Fleſh, where the *Slough* had thrown off, there ouzed out a fœtid Matter from underneath.

Believing the Caſe to be deſperate, I arm'd a Pledgit with *Liniment. Arcæi*, dipping the ſame in the foreſaid Mixture of *Mel Roſ. & Balſ. Tereb.* to apply on the Part whence the Matter iſſued forth. The other Parts of the *Membrane* I covered with the *Syndons* of *Sarſnet*, moiſten'd only with the *Mel. Roſ.* and clapping the Edges of the Silk under the ſhiver'd Edge of the *Cranium*, that the ſubjacent noble Part might not be offended thereby, I dreſs'd as before, and roll'd up the Head. The next Day, intending to make Apertion through the *Meninx*, and relieve the Brain of the fluctuating Matter, I acquainted Mr. *Herenden*, told him what I had diſcovered, and the Neceſſity of our farther Proceeding.

March the 6th we met in Conſultation, where we found the Matter ſomewhat leſſen'd in its Diſcharge, though ſtill abundantly too much. The Lips, which the Day before were fallen, looking white and flabby, and the incarned *Granules* of Fleſh upon the *Membrane*, which were then ſinking, and of the ſame Colour, had now as it were revived, and put on a freſh Complexion: Nor could we perceive the leaſt Drop of Matter burſting through in any Part of the *Membrane*, or any Room for a Probe where I had obſerv'd it ouzing forth. Upon theſe Conſiderations, though the

Symptoms

Symptoms ſtill kept up without Remiſſion; I mean, the *Fever*, *Watching*, and *Head-Ach*; yet Mr. *Herenden* ſurmiſing I might be miſtaken in my Yeſterday's Remark, or hoping, the Matter lodging only betwixt the Duplicature, had made its *Exit*, perſwaded me to dreſs up, and endeavour to relieve the Child ſome other Way: To which Purpoſe, upon farther Conſultation, it was agreed, That I ſhould preſently open the Jugular on the ſame Side, out of which, running briskly, and in a full Stream, we drew Six Ounces of Blood. A *Veſicatory* was likewiſe applied to the Neck, and an emollient Clyſter thrown up in the Evening; the *Antiepileptick Powders* were repeated with the Addition of Two Grains of *Sal. Vol. C. C.* to each Paper; the *Cephalick Julep* as before; and if the *Head-Ach* did not remit by the next Day, Leeches were concluded to be ſet behind the Ears, as alſo to each Temple.

The 9th I call'd again, and underſtood by the Nurſe the Child had a bad Night; was then hot, and reſtleſs, and cried out of his Head. This Afternoon I took off the Dreſſings, perceiv'd the Bandage and Compreſs was foul'd with the Matter, likewiſe the Pillow he had lain on, which confirmed my Belief, that it was highly reaſonable to make an Apertion through the *Dura Mater*, and that without ſo doing, all other Endeavours would prove uſeleſs. The Dreſſings taken off, I plainly obſerved from whence the Matter had come forth, but could not find a Paſſage for my Probe, although there was a ſmall Drop of Matter in the Mouth of the *Papillary Excreſcence*, the ſuppos'd Place of its Vent. There being no Artiſt by to juſtify my Proceedings, I dreſs'd up again as before; the *Warden* having promiſed to meet me on the 8th: During which Interval ſo great a Quantity of the purulent Matter had work'd out, as to afford ſome Relief to the *Brain*; ſo that the Symptoms grew milder. He tried at this Dreſſing with his Probe, but could find no Entrance. The Wound look'd freſh, and the Incarning ruddy, though not much encreas'd for Three or Four Days paſt: However, much contrary to my Sentiments, I was prevail'd upon to dreſs up, continuing my wonted Applications, and to wait a little longer, to ſee what further Time might produce, unleſs freſh Symptoms call'd for a Penetration; of which I was to give Notice.

Thus we continued to the 15th, the Pain 'twixt whiles remitting, and returning a ſtinking Gleet with much Matter upon our Dreſſings. One Day we ſeem'd to get Ground, but the next loſt it. The Lips again grew flaccid, and the Fleſh upon the *Membrane* looſe and pallid; ſo that reſolving to wait no longer, I went again to Mr. *Herenden*, and told him I ſhould loſe my Patient if he would not comply with my dividing the *Membrane*. He readily offered me his Aſſiſtance, and came according to his Appointment. When we came into the Chamber, the Child was crying very dolefully of his Head. There was a fœtid Smell by the Bed-ſide, from the putrid *Effluvia* ariſing from the pent-up Matter; and though we were ſenſible there was far too great a Quantity to proceed from the Wound, yet we could not even at this Dreſſing diſcover the Orifice that had let it out: The *Syſtole* and *Diaſtole* of the *Membrane* likewiſe hinding us from apprehending any Fluctuation under our Fingers; ſo that I cannot any ways blame, nor would I reflect upon that Gentleman's Judgment and great Caution in this Affair; he having never ſeen the Matter ariſing out of the incarned Fleſh, as I had done.

I was extreamly unwilling to dreſs again, till I had given a freer Vent; and attempted the Search once more with my Probe, yet ſtill without Succeſs: At laſt preſſing hard down upon one Side of the ſtrongly reſiliating *Dura Mater*, a ſmall Drop of Matter blubber'd out of the aforeſaid *Papilla*; which Mr. *Warden* perceiving, immediately took out a fine Probe from his Box; and preſſing gently down, got in very readily, giving Way to make an Apertion, whilſt his Probe, which he bore up underneath, was to guide my Lancet: With which Direction I paſs'd the ſame in, and made a Wound about a quarter of an Inch in Length; when ſearching more narrowly with the Probe, we found that it was got betwixt the Duplicature of the *Membrane*; ſo that without Delay examining again, he ſoon got under to the *Pia Mater*, and raiſing

up

up the Part as before with his Probe, I cut close to the Side thereof, till I had made a Wound of half an Inch, by which we discharged a vast Quantity of stinking *Pus*, interspers'd with Two or Three small Globules of the *Cortex* of the Brain.

By this last Incision we were put to a *Dilemma*, a small *Capillary Artery* being divided in the inmost Coat of this *Membrane*. Here was no Place for biting *Stipticks*, nor indeed for the common Restringents; some Part of which, with the utmost Care, must inevitably fall in upon rhe Brain, and there produce very bad Effects, if not the most direful Symptoms: Nor was there by any resisting Body underneath, any Hope that by Compression we could stay the Flux.

The Moment of its spurting up, Mr. *Herenden* with an arm'd Probe press'd close upon the Mouth thereof, which did me double Service, by restraining its Bleeding, and dilating the Wound, whilst I convey'd a Dossil, tied round with Thread, the End of which hung out for the secure Extraction, dipp'd in *Mel. Ros.* in which I had drop'd a few Drops of Tincture of *Myrrh*. Clapping this down softly upon the tender *Meninx*, or rather upon the Brain it self, the *Pia Mater* being here eroded; and having made up a Second Dossil, somewhat tighter, and fitted to the Dimensions of the Wound, tied also with a Thread as the other, whilst he took away the armed Probe, I clapp'd it close upon the wounded Vessel, which being but capillary, we were in Hopes would be soon choak'd by this Kind of Compression. Being dress'd up, he was carried to his Bed; Mr. *Herenden* acquainting the Parents, that his Case was truly doubtful, if not absolutely desperate.

Mr. *Blundel* being now got abroad from a Fit of the *Gout*, was easily prevailed upon to give us a Visit; and having inspected the Work, pass'd in his Probe down to the *Pia Mater*; but finding no slanting *Sinus*, only a direct one to the Brain, concluded there was no dilating: For indeed where could we cut, unless upon this lower *Meninx*, or into the Brain it self. Our Work was all in the dark; nor could we know the Source of the Matter, daily discharging in small Quantity; so that all we could do, was to prevent the Coalition of the Wound, and give a freer Vent. To keep the Wound open, which was the more difficult in Consideration of the Part, I propos'd a little *Canula*, but he rather preferr'd a Bit of Sponge-Tent, which he thought would not only lie much easier, but imbibing the Matter, discharge it at the same Time. With this I comply'd, and put in a small Piece, fasten'd about with a String on the upper Part.

Next Day, when I came to open the Wound, I found the Matter, as I fear'd, was entirely pent in; nor had one Drop of it pass'd either by the Sides or through the Pores of the Sponge; but drawing the same forth by the Thread, a considerable Quantity gush'd forth, and continued to be thrown off by the Systole of the *Dura Mater*, till it had emptied the Cavity of all it could lift up. The Orifice being now enlarged by the Tent, I applied a small Pledgit of Liniment on the Outside, having beforehand drop'd in with a Feather a Drop or Two of *Mel. Rosar.* and observed this Way of Dressing, still breaking asunder the uniting Fibres with my Probe, where they were ready to coalesce; and dipping its End in Oil, besmear'd the Lips of the Wound, by which Means the Matter, which became now again inconsiderable, made its Way without Obstacle. And thus we continued to the Middle of *May*, our young Gentleman growing fleshy, and enjoying a better State of Health than he had some Time before. Mr. *Blundel* had the Curiosity to examine the Wound again; and having the Probe streight down for about half an Inch, discovered a slanting *Sinus*, not observed before; when drawing it forth to bend the End, he pass'd the same in again, and lifting up the Extremity, we could perceive it near an Inch distant from the Place it enter'd. Having made this Discovery, I resolved, if the Discharge continued much longer, or any Symptom return'd, to cut into this Cavity. The same Day the By-standers had observ'd a Sort of Rigour had seiz'd the Child, which went off in a Moment. When I dress'd him the next Day, I perceiv'd something of that Kind.

The Wound was again open'd by the Digestive I had applied the Day before, and the scabby Crust cast off, with a small

Quantity of Matter as uſual. I was very much concern'd at thoſe Rigours that had happen'd, being fearful leſt the Matter ſhould have gotten into the Blood, or tainted the Nerves, by inſinuating it ſelf through the cortical Part of the *Brain*: But did not expect the Surprize ſo ſudden; for early the next Morning I was alarm'd with the News, that the Child was ſeiz'd with a violent *Convulſion*, I haſten'd, and found him ſenſeleſs, very ſtrongly twitch'd on the contrary Side, the *Tendons* of that Arm and Leg eſpecially perpetually relaxing, and again contracting: Upon which I ordered him what I thought proper upon this Occaſion; and while the Medicines were preparing, took him out of Bed; and paſſing my Probe into the *Sinus* of the Wound we had diſcovered, I carefully cut through upon my Probe, without Loſs of Blood or Matter; which making a Dreſſing upon, I preſently perceiv'd the *Spaſms* grow milder. Returning to him in the Afternoon, I heard they had held him in the Manner I had left him for near an Hour; that he had been ſeiz'd with Two or Three Fits ſince; but from the Firſt Paroxiſm they obſerved a *Palſey* on the Arm of the Side affected, which was thereby become incapable of Motion; for which I preſcrib'd proper Means to the beſt of my Judgment.

In the Evening I return'd again, found the Child ſenſible; his Fits had been off and on at Two or Three Hours Diſtance. He then complained of being ſick, and retch'd to vomit: His *Head-Ach* was alſo very troubleſome.

May the 18th, which was the Day after theſe *Convulſions*, I undreſs'd his Head, and found all Things had an ill Aſpect; and ſo continued till the 23d of the ſame Month, when I had Notice he was dead.

The Day after I took with me a ſmall capital Saw, and a Diſſecting-Knife; and placing the Head to my Advantage, I divided the *Scalp* from the *Baſe* of the *Occiput*, cloſe by the *Sagittal Suture*, to the Top of the Forehead; then turning it down, together with the *Temporal Muſcle*, which I raiſed over the Ear of the wounded Side of the Head. With the Back of the Knife I cleared off the *Pericranium*, and with my Saw I got through the *Skull*; which being remov'd with the End of my *Spatula*, the Right Hemiſphere of the Brain I found would come into View, by only clipping off the *Dura Mater*. But before I began to meddle with this latter, having rais'd up the Side of the Skull, I took ſpecial Notice of that Part of the *Membrane* which I had formerly divided or cut in Two, and of the ſubjacent *Pia Mater* and *Cerebrum*.

I perceiv'd there had been ingender'd a fibrous Subſtance; but whether ſpringing from the tender *Meninx*, or complicated together of both Membranes and Veſſels, are not ſo eaſie to determine. Two or Three Days before it ſeem'd to be an Inch thick; but after Death growing flabby, it parted upon the leaſt Touch, and was fallen off from the upper *Membrane*, though here and there continuous with the under one. When I had removed this interpoſing Body, I expected to find ſome lateral Abſceſs upon the Subſtance of the Brain, at leaſt upon the *Pia Mater*, where all that was conſpicuous were the larger Ramifications of the Sanguiferous Veſſels upon the Surface of the *Membrane*, whoſe Cavities, inſtead of their naturally contain'd *Cruor*, were fill'd with a tranſparent *Pus*, more eſpecially thoſe upon the anterior *Lobe* under the *Os Frontis*, where the *Head-Ach* was at firſt, as well as at the laſt, continually pointed to.

Cutting into the *Cortical* Part of the Brain, I found all free and clear, as in a ſound State. The *Ventricles* likewiſe, the *oblong Marrow*, alſo the *Cerebell*, were firm, and to the Eye untainted. Being now minded to take a View of the other Side, I divided the *Falx*; and without ſawing off that Part of the *Cranium* with my Hand, brought out the Left *Hemiſphere*: The Veſſels on whoſe Surface, in like Manner with the Right, were conſpicuouſly turgid with the ſame Matter; a little of which here and there was ſhed upon the *Cortex* of the *Brain*. At the Firſt Sight I thought it might lie on the Outſide of the *Pia Mater*; but going over gently with the Back of my Knife, and wiping alſo with a ſoft Sponge, I found it not removed; ſo that in ſeveral Places, opening the Membrane with the Point of my Lancet, I perceiv'd it lay immediately upon the Subſtance of the Brain, and iſſued out through each Apertion.

Having

Having thus far ſatisfied my own Curioſity, I placed the Brain where I found it; and fitting it to the divided Skull, drew over the *Scalp*, which ſtitching up, and with the Point of my Needle raiſing the ſhort Hair to cover the ſaid Stitches, 'twas no eaſie Matter for the niceſt Surveyor to perceive that the Brain had been taken out and inſpected, or the *Cranium* meddled with: But this only by the bye.

An Explanation of the Figure, N° IV.

a. The *Fracture*, with a quadrangular Depreſſion, as it appear'd *in Situ* when the *Scalp* was removed by a circular Inciſion.
b. The Part on which was ſet the Trepan.
c. The *Fractured Bones*, contiguouſly plac'd after they were rais'd by the Elevator.
d, e, f, g. A View of the ſame Bones ſeparately, according to their true Dimenſions.
h. The perforated Piece taken out by the *Trepan*, for the more commodiouſly raiſing the depreſs'd Bones.
1. The *Os Frontis*.
2. The Right *Bregma*.
3. Part of the *Os Occipitis*.
4. The Temporal Bone.
5. The Maſtoide Proceſs.
6. The *Os Jugale*.
7. The Firſt Bone of the Upper-Jaw.
8. The upper Orbit of the Eye.
9. The lower Orbit.
10. The Bone of the Noſe.
11. The *Os Malæ*, or Fourth Bone of the Upper-Jaw.
12. The Upper Jaw-Bone, with the Teeth.
A. The Coronal Suture.
B. The Squamoſe Suture.
C. The Lambdoide Suture.
D. The Paſſage of the Ear.

Of the WOUNDS *and* FRACTURES *of the* HEAD. *Taken out of Monſieur* de St. Hilaire's *Anatomy of the Humane Body*, &c.

THE Wounds of the Head are divided into ſuch as are only *external* and not *penetrating*, and into ſuch as are *internal* and *penetrating*.

The exterior are ſubdivided again into thoſe that are accompanied by a Fracture of the Skull, or elſe ſuch as are without a Fracture, as when they do not penetrate any deeper than to the *Pericranium*, which inveſts the Skull.

The great Contuſions that happen upon the Integuments of the Head, are at all Times accompanied by a conſiderable Coagulation of the Blood, as alſo of the *Lympha*, which occaſions a large liquid Tumour, that will ſuppurate ſoon after.

Theſe grand Contuſions are ſometimes attended with a Gangrene, becauſe thoſe Juices that are ſtopp'd in their natural Courſe, having conſequently their due Communication with the other that continue their Circulation interrupted, find themſelves deprived of the Advantage and Effects of the Spirits, and thereupon acquiring an acrious and corroſive Nature, they corrode the ſmall *Tubuli* which have been bruiſed by the Fall or Contuſion, and have no Connexion with the reſt, becauſe they are all diſunited and broken aſunder.

Thus we ſee, that the immediate Cauſe of a Contuſion does depend on Two different Things: The *Firſt* is, the confuſed Mixture of the ſmall *Tubuli* that are broken aſunder; and the *Second*, the Acrimony which has been contracted by the Blood and the other nutritious Juices, which compleat the total Diſruption of thoſe ſmall *Tubuli*, which in a great Meaſure were diſunited before by the Force of the Blow or Fall.

The Wounds of the *Pericranium* are not without Danger, no more than thoſe that happen to light upon the Temporal Muſcles, or the *Crotaphites*, by reaſon they are moſt frequently attended with exceſſive Pains, a Fever, with Convulſions, and divers other pernicious Symptoms.

The Wounds of the Head, as well as of the other Parts of our Body, are very difficult to be cured in thoſe that are affected either with the *French* Diſeaſe, or elſe with the *Scurvey* to any conſiderable Degree, becauſe in thoſe Perſons the Blood contains abundance of acid, acrious, and corroſive Particles, in the Nature of an *Aqua fortis*, which of Neceſſity muſt hinder their Reunion or Conſolidation.

For no Body can be ignorant, that in order to effect this Reunion, there is required ſuch a nutritious Juice, as conſiſts of ſweet, ſouple, and pliable Particles, ſuch as are provided with and compoſed of ſmall Twigs, that are proper to adhere to one another, and conſequently to form new Filaments or Fibres, by the Means of which the nutritious Juice, that is daily ſupplied afreſh, may be fitly applied without Intermiſſion to the Opening of the Wound, in order to fill up the Aperture or Breach.

Nothing can be more pernicious to the Wounds of the Head than for the Air to touch upon them; for the Air being repleniſh'd with acid Particles, that are apt to coagulate the nutritious Juice at the ſmall Orifices of the ſmall *Tubuli* of the Parts where the Diſruption or Diſunion is made; ſo that this Juice contracting an acrimonious Quality, by Degrees introduces a Mortification in the Parts.

The Wounds of the Head are alſo very dangerous in thoſe Perſons that are affected with an ill Habit of Body: Beſides this, they prove moſt commonly more dangerous in the Summer than in the Winter. But after all, even in theſe laſt you muſt take Care to keep them warm, generally ſpeaking, for the cold Air is a great Enemy to Wounds, becauſe being repleniſh'd with certain acid nitrous Particles, theſe will inſinuate themſelves into the Pores of the affected Part, will cauſe a Diſruption in their natural Contexture, and by introducing a Coagulation in the nutritious Juices, will at laſt produce a Gangrene.

'Tis certain, that were it poſſible to prevent the Air from entring into the Aperture of the Wound, at the ſame Moment that it is made, as alſo the iſſuing of the Juices or Humours from the ſmall *Tubuli*, the Wound would infallibly be reunited in a very ſhort Time.

The Fractures of the Skull owe their Origine either to a Fall, or elſe to ſome Blow, which is received either by ſome ſharp-edged, or elſe by ſome blunt Inſtrument; ſo that the Skull may be affected by Two different Means, to wit, either by an *Inciſion*, or elſe by a *Contuſion:* By an *Inciſion*, in caſe the Blow was given with ſome ſharp-edged Inſtrument; but by a Contuſion, if the Blow was given by a blunt Inſtrument, or elſe was occaſion'd by a Fall.

Notwithſtanding this, they make no leſs than Five different Kinds of Fractures, which are commonly known by theſe Names, to wit, *Fente*, *i. e.* a Crack or Split; *Contuſion*, *i. e.* a Contuſion; *Inciſion*, *i. e.* an Inciſion; *Emforiccure*, *i. e.* a Depreſſion; and *Controfente*, *i. e.* a Counter-crack: But in my Opinion, theſe Five may very properly be reduced under Two Heads, to wit, the *Inciſion* and the *Contuſion*, becauſe the *Crack*, the *Inciſion*, and the *Counter-crack*, are actually all Three of One Kind, which belong to the *Inciſion*; and the *Depreſſion* and the *Contuſion* do conſtitute the Second *Species*.

There are Two Sorts of Contuſions; one, which does not interrupt or deſtroy the Continuity of the affected Part, is called the *Thlaſis*; and the other, which actually produces a Diſruption in the Part, is called the *Enthlaſis*.

The *Contuſion* which does not deſtroy the Continuity of the affected Part, and which is called the *Thlaſis*, is a Depreſſion of the Bone without a Diſruption. This Sort of Fracture happens moſt of all among young Children; for their Bones being as yet extreamly tender, they are conſequently pliable, and apt to give Way to the Blow; which is the Reaſon that they are not eaſily broken aſunder: Juſt as we ſee in the Veſſels made of Pewter, that they will eaſily be bruiſed, but ſeldom break, which muſt be attributed to the Flexibility and Pliableneſs of the Metal.

When the Contuſion does not deſtroy the Continuity of the Part, the Bone has no Unevenneſs upon it; ſo that you perceive only a *Crack*. If this *Crack* proves to be apparent, it is called *Rogme*; but if it is inſenſible, 'tis called *Trixiſmos*, or the *Capillary Crack*.

The *Inciſion* is divided into Three different Sorts; to wit, the *Ecope*, the *Diacope*, and Thirdly, into the *Apokeparniſmos*.

The *Ecope* is, when the wounded Perſon has received a Blow directly upon the affected Part, which has produced only an Inciſion, without taking off any Piece or Part.

The *Diacope* is called that Sort of Fracture which is made by a Blow given obliquely and

and which penetrates into the Subſtance of the Bone, without cutting it aſunder.

The *Apokeparniſmos* is that Sort of Fracture when a Piece of the Bone is abſolutely ſtruck or taken off by the Blow.

The *Enthlaſis*, or *Eſphlaſis*, is called that Sort of a Fracture when there is a Depreſſion in the Bone, which deſtroys the Equality and Continuity of the Bone, and which has a Splinter with it.

Of this there are Three Sorts, to wit, the *Ecpieſma*, the *Angiſoma*, and the *Camaroſis*.

The *Ecpieſma* is called that Fracture when there is a Depreſſion of the Skull; and at the ſame Time a Splinter that preſſes upon the *Dura Mater* underneath the Skull.

The *Angiſoma* is that Sort of a Fracture when there is a Depreſſion in the Skull; and that there is a Separation of a Splinter, which Splinter paſſes under the ſound Part of the Bone.

The *Camaroſis*, or arched Fracture, is ſubdivided into no leſs than five Sorts. In the *Firſt* of theſe, one Part of the Bone, when it is broken, is depreſſed downwards, and the other Parts riſe upward.

In the *Second* Kind of the *Camaroſis* the Bone ſuffers a Depreſſion without being crack'd. This Depreſſion ſeldom happens in any other Skulls, but in thoſe of young Children.

The *Third* Sort of the *Camaroſis* is a Sort of a Contuſion where both the Edges are depreſſed inwards, and the middle of the Bone remains ſtanding upwards like an Arch, leaving a Vacuity underneath.

The *Fourth* Kind of the *Camaroſis* is called that Sort of a Fracture when a Bone raiſes it ſelf upwards by its own Elaſtick Vertue. This Sort of Fracture happens only in Children whoſe Bones are ſtill Membranous, which produces this Elaſticity in them.

The *Fifth* Kind of the *Camaroſis* happens when the Second Table of the Skull ſuffers a Depreſſion, but the firſt riſes up again into its natural Poſition. This Sort of Fracture likewiſe happens only to Children, becauſe in Adults the Bones are too hard and too dry for an Elaſticity.

The *Counter*-Crack is ſaid to happen three different Ways; to wit, in the ſame Bone, in ſeveral Bones, or in the two different Tables.

It happens in the ſame Bone when the Blow lights upon the ſuperior Part of the Bone, but the inferior is crack'd only.

It happens in ſeveral Bones, as for Inſtance, when a Man happens to fall upon the *Occiput* and the *Os Coronale* is only fractured.

It happens in different Tables, when the firſt Table of the Skull receives the Blow, and yet the Second is only fractured.

It ſeems not probable that the *Counter-Crack* ſhould happen in the Skulls, as it is commonly repreſented. If any ſuch Thing happens, it muſt be in thoſe Perſons who have their Skull of one ſingle Bone only: For there are many humane Skulls which have no Sutures; ſo that in theſe Skulls, there being but one Continuity of the Bone, it is no difficult Matter to conceive, as for Inſtance, than when the *Os Parietale* on the Left Side receives ſome violent Blow, it may notwithſtanding this remain entire, when at the ſame Time the *Os Parietale* on the Right Side may be crack'd; for the Skull being but one continued Bone, that Part where the Blow did light might give Way, and the Motion being communicated to the oppoſite Side, might crack it, eſpecially if it happened to be unequal, and thinner or weaker than the other.

In Reference to thoſe Counter-cracks or Blows that are ſaid to have been obſerved in thoſe Skulls that are articulated by Sutures, it muſt have happened in the following Manner:

When a Man receives a violent Blow on the Head, he is, perhaps, quite ſtunn'd. He falls perhaps upon the oppoſite Side, without being ſenſible, or remembring of what has happened; and thus he may have ſeveral Falls. Upon ſuch like an Occaſion it may eaſily happen, that the Blow which he received on his Head did produce a large Wound in the Integuments of the Head, without breaking the Skull; and at the ſame Time the ſucceeding Fall which happened whilſt he was not in his Senſes, might not occaſion any apparent Wound in the Integuments, and yet produce a Crack in the Bone.

Now it is eaſy to conceive, that the wounded Perſon being not able to tell the Chirurgeon that he did fall after he had received the Blow, becauſe he knows nothing of it, and that there is no Appearance of a Wound on that Side where the Fracture is, a Chirurgeon may eaſily be miſtaken in this Conjecture.

Neither

Neither is it to be imagined, that a Man cannot fall upon his Head, nor break his Skull, without an apparent Wound in that Part, becauſe we are convinced by daily Experience, that a Leg may be broken either by a Fall or by a Blow, without any apparent Wound in the fleſhy Parts.

If any ſuch Thing did ever happen, as many Practitioners in Chirurgery ſay it has, that the inferior Table of the Skull has actually been broken or crack'd when the ſuperior *Lamina* has not been wounded, it muſt have happened in the following Manner:

'Tis well known that there is an Interſtice betwixt the two Tables of the Skull, which is filled up with a certain Contexture of ſmall Bones, provided with a ſpongious and very porous Sort of Marrow. The Poroſities of this medullary Pith being repleniſh'd with ſome Matter, (provided it be true that there is no Vacuity in Nature) we will ſuppoſe this Matter to be the Air, and a Man happening to receive a violent Blow with a blunt Inſtrument, the ſuperior Table of the Skull may give Way a little without being crack'd. Whilſt it gives Way, it muſt of Neceſſity compreſs the Air that is betwixt the two Tables, and the inferior Table being of a more ſtrait Contexture, ſo as not to give Paſſage to the Air, it ruſhes or hits with great Impetuoſity againſt that Side, and conſequently occaſions a Fracture.

The ſame Reaſon we have alledged for the Fracture of the inferior Table of the Skull, may take Place in, or be applied to, the Opinion of thoſe who believe, that the Skull may be crack'd by a Counter-Blow.

Sometimes it may happen that there is a certain Matter ſpread upon the *Dura Mater*, tho' the ſuperior Table of the Head has not been impaired. This happens thus: The medullary Subſtance which lies incloſed betwixt the two *Laminæ* of the Skull being either putrified or rendered acrious by ſome Cauſe or other, this introduces a *Caries* and Corruption in the inferior Table of the Skull, it is worn out, and the purulent Matter penetrating thro' it, is ſettled upon the *Dura Mater*.

The *Signs* which diſcover to us the Fractures or Diſruptions of the Skull, are of Two Sorts; to wit, either *Conjectural*, or elſe *Certain*.

The *Conjectural Signs* are to be taken from the Symptoms that attend the Fracture; as for Inſtance, If the Patient is wounded on the Head, whether he is afflicted with an exceſſive Pain? If he has received his Wound by a Fall, whether it was attended with a *Sincope*? Whether, after he had recovered his Senſes, he found his Reaſon impaired? Whether he was ſeized with a Giddineſs in his Head? Whether with a Bloating or Swelling of his Eyes? Whether the Blood did iſſue forth thro' his Noſe, Mouth, or Ears? Whether he had any bileous Vomiting, Convulſive Motions, a Feaver, and other ſuch like pernicious Symptoms?

The *Certain Signs*, are called thoſe that are obvious to the Eye, when the Bone is laid open; or whether by touching it with your Finger, or with the Probe, you diſcover the Fracture; which, beſides this, is very often alſo accompanied by ſome dangerous Symptoms.

The larger and deeper the Fractures of the Skull are, the more dangerous they prove; but eſpecially if the *Splinters* wound the *Dura Mater*; and that there is a Settlement of Blood upon it, which turning into a Corruption, produces Inflammations, and divers other pernicious Symptoms.

The *Gummous Tumors* of the Skull are certain hard Prominencies, for the moſt Part without Pain, fixed very cloſe to the *Pericranium*, and are produced by the Accretion of the nutritious Juice.

The *Exoſtoſes* of the Skull are certain thick Nodes upon the Surface of the Bone, cauſed by a thick glutinous Matter which has been coagulated by the Acidity of the *Lympha*. Theſe Tumors are frequently obſervable in the *French* Diſeaſe.

The gummous Tumors of the Skull are eaſie to be diſcerned; for we feel on the Head certain Inequalities which reſiſt to the Touch, and ſometimes are attended with Pain. When the *Pericranium* is not faſtened to the Tumor, they are without Pain; but when theſe Tumors are fixed to the *Pericranium*, and eſpecially in the *French* Diſeaſe, theſe Tumors produce almoſt inſupportable Night Pains; for the acrious ſaline Particles of the Tumors being exagitated by the Heat of the Bed, they ſhake the nervous Fibres of the *Pericranium*, and at laſt, the

Bone

Bone, contracts a *Caries* at the Place where the Tumor is.

The *Exoſtoſes* are eaſily to be known from what has been ſaid in their Definition.

The *Tumors* and *Exoſtoſes* of the Skull, as well as of the other Bones, are produced by the nutritious Juices of the Bone, which is coagulated by the Intermixture of ſome acrious and acid Seroſity, which has been extravaſated, and which, by corroding the ſmall *Tubuli* of the Bones, has cauſed this Coagulation of the nutritious Juice.

The *Tumors* and *Exoſtoſes* of the Bone are much more dangerous than many are apt to believe; for being fixed to the Membranes, theſe Membranes are in Proceſs of Time quite conſumed, and then the Bone is ſeized with a *Caries*. When ever theſe Tumors are the Conſequences of the *French* Diſeaſe, 'tis a very ill Sign; which abſolutely aſſures us, that the *Lympha* has contracted a very high Degree of Acidity, becauſe it corrodes the very Subſtance of the Bones.

Of Contorted *and* Mis-ſhaped FEET. *Taken out of Monſieur* Dionis's *Chirurgical Operations.*

SOmetimes we meet with People who have their Feet mis-ſhaped or diſtorted, which not only cauſes a Deformity, but alſo no ſmall Inconveniency in Walking. Some have their Feet turn'd outwards, and are call'd in *Latin Valgi*; others inward, and are call'd by the *Latins Vari*.

Theſe Sorts of Diſtortions of the Feet owe their Origin to Three different Cauſes. For a Child is ſometimes born with diſtorted Feet; or elſe it happens by ſome Accident, as in Luxations; or elſe by ſome external Violence or Defluxion of the Humours, which produces an *Anchyloſis*; or by a Cuſtom gone into a Habit, as when a Child accuſtoms it ſelf to turn his Feet inwards.

If ſuch an ill Diſpoſition is brought along with the Child into the World, 'tis very difficult to be cured; but if it be contracted by an ill Cuſtom or Habit of the Child, it may admit of a Cure, if you order the Nurſe to put a ſmall Bolſter, *A*, betwixt the Feet, and then keep the Feet firm and ſteady by the Means of a Band, *B*, which muſt be pretty ſtreight. The Nurſe muſt be careful, as often as ſhe undoes the Rollings of the Child, to put the Feet in a right Poſition, and to keep them in the ſame Poſture, by rolling the Bands ſtraiter in that Place: Whereas if this ill Diſpoſition be contracted in the Mother's Womb, 'tis in vain to pretend to correct it. I know one of my Relations, who brought ſuch a Foot with him into the World, becauſe his Mother look'd ſtedfaſt upon a Beggar who had his Feet turn'd inwards, who, in Spite of all the Remedies and Contrivances that could be applied, retains his Foot in the ſame Poſture as he brought it into the World, though he is now Thirty Years old.

In caſe a Foot has been deprived of its natural Conformation or Figure by ſome Accident or other; as by a Luxation, by a Wound given by Fire-Arms, where the Bone is broken, or by an *Anchyloſis*, occaſioned by a certain gelatinous concreted Humour, by which the Bones whereof it conſiſts are deprived of their natural Motions. It is the Chirurgeon's Buſineſs to examine into the Cauſe of this Diſaſter, and to apply ſuch Remedies as are capable of ſoftening the Ligaments and the *Eſcar*, which are the Cauſe of this ill Conformation. Of this Kind are, frequent Fomentations with the Liquor of boiled Tripe, Frictions with oily Matters, and Cataplaſms made of emollient and mucilaginous Herbs and Roots, as *Marſh-Mallows*, the *Fenugreek*, Linſeed, *&c.* boil'd up with freſh Butter, or Oil of Lillies.

Whilſt you are uſing theſe Remedies, you muſt once a Day at leaſt endeavour, not without ſome gentle Violence, to ſtir and turn the Foot: And you may likewiſe apply pretty large Bolſters or Splinters of Wood, or ſmall Iron Plates, which muſt be faſtened by the Help of a Band, the better to keep and retain the Foot firm and ſteady in the ſame Poſition you have thought fit to place it.

But if you find theſe Means inſufficient to attain your End, you muſt have Recourſe to certain Engines, being a Kind of Boots, either of Braſs or Iron, *C*, which muſt be ſhaped proportionable to the ill Diſpoſition of the Foot you deſign to amend.

But

But becauſe it often happens, that in thoſe Boots that are all of a Piece, a Foot that has an ill Conformation will hardly enter, or if it does, it will not admit of an equal and ſufficient Compreſſion to reſtore it to its natural Figure; you muſt then contrive theſe Boots to be made of Two Pieces, *D*, *D*, not unlike unto the Caſes in which we keep ſome fine Pieces of Plate, which being divided in the Middle lengthways, are faſten'd together by ſmall Hooks.

You muſt put the Foot into one Half of thoſe Boots, and then fitting the other Half to it, and keeping it firm by the Means of Hooks, the Foot is then incloſed like in a Caſe; ſo that in Proceſs of Time it is forc'd into its natural Figure.

But if there be ſuch a Contraction or Calloſity in the Ligaments, as will not give Way to theſe Remedies and Engines, you muſt ſend your Patient to the Waters of *Bourbon*, or *Banege*; which being endued with a balſamick Virtue, may reſtore the Part to its natural Motion: Whereof I have ſeen divers Inſtances in many Officers of the Army, who having received very large Wounds in the Joints, did return from thence at leaſt in a much better Condition than they went, if they were not abſolutely cured. Nothing is more common than to ſee Children have their Joints much thicker than they ought to be, *viz.* at the Extremities of the Bones, where they have their Articulations: For theſe Extremities being more porous than the reſt of the Bone, and theſe Poroſities being full of a medullary Juice, are not ſo ſoon dried up in ſome Children as in others, either by Reaſon of ſome Weakneſs, or for want of a ſufficient natural Heat: Whence it is, that theſe Joints will continue to be big, till by a ſufficient Quantity of natural Heat, the Parts are compleatly oſſified, and brought to their full Degree of Solidity.

The Nature of theſe Bones is very much like unto that of the Leg of a Calf, which is repleniſh'd with a medullary Juice, and ſo tender and porous, that it may eaſily be broken or crack'd with the Teeth; and therefore it is no ſurprizing Thing to ſee the Bones of ſome Infants, which are as tender as theſe, very backward in attaining to their natural Solidity.

We alſo ſometimes meet with Children, who have the Bones of their Thighs and Legs incurvated in the Shape of a Bow. Whenever ſuch a Thing happens, it muſt be attributed to the Mothers and Nurſes, who being over-eager to ſee their Children walk before their due Time, ſet them upon their Legs, and thus make theſe Bones bear the Weight of the whole Body, and that before they have ſufficient Strength to ſupport it; ſo that the Bones of the Thighs and Legs being forced to bend under the Weight of it, ſuffer a Contortion by Degrees, if the Mother or Nurſe perſeveres in the ſame Courſe, of putting a greater Weight upon them than they are able to bear. And it is obſervable, that theſe poor Children clap their Knees cloſe to each other, the better to ſupport the Weight of their Body; whereby they ſuffer ſuch a Contortion in their Legs, as will ſtick to them as long as they live.

When you find ſuch a Contortion or Incurvation in the Bones of an Infant, 'tis in vain to pretend to reſtore it to its natural Poſition by any Operation whatever. The beſt Thing to be done in this Caſe is, to keep it either lying or ſitting always in a Chair, and not to ſet it upon his Feet, or let it walk, but to expect with Patience the due Time till the Joints have acquired their natural State, and that the Bones are arrived to a compleat Oſſification; and nothing but Time and the natural Heat is able to accompliſh either one or the other: And therefore it is a great Folly to be ſo impatient to ſee the Child walk, before its Bones are brought to their full Perfection, and before they have Strength ſufficient to ſupport the Weight of the whole Body: For what can be more irrational, than to expect more from their tender Bones than they are able to perform?

An Extortion is a certain Effort made in the Articulation of the Foot, by a violent and painful Extenſion of the Ligaments, wherewith it is tied to the Bones of the Leg.

It is of Two Sorts; one when the Ligaments on the outer Ankle ſuffer this Extenſion,

ſion, and the other, when thoſe of the inner Ankle are affected in the ſame Manner. In the *Firſt*, the Foot is turn'd inwards; and in the *Second*, it turns outwards. This laſt happens but ſeldom; but the other, moſt frequently.

Either of theſe Accidents owe their Cauſe to ſome falſe Step we make, either in Walking, Running, or Leaping; for when the Foot hits upon an uneven Place, it is apt to bend on that Side where the Declivity of the Ground lies: As it happened to an Officer of the King's *Swiſs* Guard, who taking a Leap out of a Bark in the Harbour, and lighting upon a rugged Ground, ſuffered the moſt violent Intorſion that ever I ſaw in all my Life; for the Weight of his Body proving an additional Misfortune to the Slip he made, produced a moſt violent Extravaſation of the Blood all over the Foot and the Leg; ſo that I was forced to bleed him Five Times; and after all, I feared no leſs than that a Mortification would enſue, his Leg being black from one End to the other. I was obliged to leave him behind at *Bourdeaux*; but he overtook us afterwards at *Thouloufe*.

I know ſome, who, immediately after the Sprain is gotten, put the Foot in a Veſſel with cold Water; looking upon this as the ſtrongeſt Repercutient that can be, becauſe, ſay they, the Coldneſs of the Water contracts the Ligaments that are too much extended, and hinders the Defluxion upon the Part.

Others there are, who preſcribe a Pickled Herring as an infallible Remedy in this Caſe. They beat the Herring well in a Mortar, and then apply it to the Sprain in Form of a Cataplaſm.

As for my own Part, I always make Uſe of a ſmall Defenſative, made of the Whites of Eggs, Oil of Roſes, and powder'd Alum. This I ſpread upon a Piece of Cloth, and for the Firſt Two or Three Days lay a Compreſs, and put a ſtreight Bandage, over it. On the Third Day I make an Aromatick and Adſtringent Wine, with the Lees or Seethings of the Wine, Roſes, Wormwood, Roſemary, the Peel of Pomegranates, Gall-Apples, Alum, and common Salt. With this Wine I foment the Foot very warm, and over it apply a Compreſs ſoak'd in the ſame Wine, with a Bandage, which I always ſtreighten more now than at firſt.

The due Application of the Compreſs and Bandage contributing as much to the Cure of the *Sprain* as the Remedies themſelves, it is requiſite therefore to proceed with them in a due Method.

The Compreſs ought to be Four-doubled, of the Breadth of Four Inches, and about half an Ell in Length. Its Middle muſt be placed on the Sole of the Foot, and its Two Chiefs brought acroſs each other upon the Inſtep of the Foot, and each of them is to terminate with a circular Circumvolution, that ſurrounds the Ankles. The Band muſt be Two Inches broad, and Two Yards and a half long. Its Firſt Chief is applied to the oppoſite Part where the Sprain is, that ſo it may be carried under the Foot, in order to raiſe and keep it in a ſtreight Poſition. You muſt continue theſe Circumvolutions, every one of which goes croſs each other upon the Inſtep of the Foot; and you conclude with a circular Circumvolution above the Ankles.

After you have made Uſe of the Adſtringent Wine for Ten or Twelve Days, you muſt apply over it an Adſtringent Emplaſter, ſpread upon a Piece of Leather, over which you may apply a ſimple Band, which need be neither ſo long nor ſo broad as the former; but you make the ſame Circumvolutions with it: And you may ſew the laſt Chief, becauſe it is to be left on till the Patient perceives that there is no farther Occaſion for any Bandage.

However, this does ſometimes not happen ſo ſoon as it were to be wiſh'd; for when it happens to be a violent *Sprain*, the Patient ſometimes feels the Effects thereof for ſeveral Years after; for whenever he walks upon any rugged Ground, he will always obſerve a Diſpoſition in the ſame Foot, of ſlipping that Way where it was turn'd before; and therefore it behoves People under thoſe Circumſtances to walk with Circumſpection, and to ſee where they ſet their Feet, till ſuch Time that the affected Foot has recovered its full Strength.

Of Echymoſis *and* Warts. *By the ſame Author.*

THE Word *Echymoſis* is derived from *Ex*, *i. e.* outwards, and of *Chimoin*, which ſignifies as much as to *tarniſh*, or give a livid Colour, becauſe this Diſeaſe is nothing elſe but a Settling of the Blood under the Skin, which tarniſhes it, and gives it a black Colour. It owes its Cauſe to a Contuſion, or ſome other external Violence, which cauſing a Diſruption in the ſmall Muſcular Fibres and the ſmall Capillary Veſſels, produce an Extravaſation of the Blood, which iſſues from thoſe Veſſels, and taints the Skin with a livid and marble-like Colour.

Some of theſe are ſlight, as when we pinch the Skin or when a Drop or Two of Blood is ſettled under the Skin after *Venæſection*.

But there are others alſo which are of more Conſequence, ſuch as are occaſion'd by a Fall, or by a Stroak given with a Stone or Stick.

And there are others again which are not without Danger: As; I happen'd to be call'd once to a Perſon, who attempting to leap over a Ditch, broke a Blood-Veſſel in his Leg, whence flow'd a conſiderable Quantity of Blood, which being concreted and ſethed, made his whole Leg ſwell moſt exceſſively, ſo that it turn'd all over as black as a Coal.

A ſlight *Echymoſis* is ſometimes without, or at the moſt attended with little Pain, and is not of any dangerous Conſequence. They only ſpoil the Skin, and marble it with a livid Colour.

When the concreted Blood is only in a ſmall Quantity, it will diſperſe inſenſibly; but if there be much of it, it will turn into an Abſceſs, which at laſt ends in a Suppuration: And if this concreted Blood be in a great Quantity, it may produce a *Gangrene* and a *Sphacelus*, by cauſing an exceſſive Compreſſion in the Part, and preventing the natural Heat from exerting its Vigour there.

'Tis obſervable, that the Contuſions on the Legs and Feet are more difficult to be cured than thoſe that happen in the other Parts, becauſe the Skin on the Legs and Feet being thicker and cloſer than in other Parts, the Blood is not ſo ſoon diſperſed there.

An *Echymoſis* always is occaſioned by ſome external Cauſes, as by a Fall or Blow received; for whenever any Thing that is weighty falls upon or hits againſt our Body with Violence, the Veſſels ſuffering a Compreſſion by the Force of the Stroak, are neceſſitated to approach and draw cloſe to one another, and preſſes the Blood out of the Orifices in that Part where theſe Veſſels end.

A ſlight *Echymoſis* is ſoon cured by the Application only of ſome warm Wine, ſome *Aquavitæ*, Spirit of Wine, or Queen of *Hungary*'s Water, of the white Balſam of *Fioraventi*. If there remains any of the black Colour behind, you may take it off, by putting ſome Virgin's-Wax upon the Place where the Hurt is received.

In an *Echymoſis* of the Eyes, which happens ſometimes in playing with the Ball, or at the Tennis-Court, *viz.* when the Ball happens to ſtrike or hit againſt this Part, you may apply ſome cold Water to it, it being a very proper Repercutient to check the Swelling. But 'tis obſervable, that the cold Water is very good the Firſt Day; but afterwards you muſt have Recourſe to diſſolvent Remedies: For which Purpoſe you may prepare a ſmall *Collyrium* of *Fennel* and *Eyebright*-Water, mix'd with a little Saffron, Camphore, and a few Drops of the Spirit of *Sal Armoniac*.

If the Contuſion be very great, Wormwood boil'd in Wine is a very good Remedy: Or elſe you may make an Infuſion of the Flowers of St. *John*'s-wort, Nutmegs, Cloves, and the Peel of Pomegroanates, in the beſt Spirit of Wine, wherewith you may bathe and rub the affected Part.

You may apply alſo Cataplaſms made of the Four Flowers, with *Bryony*, Flowers of Roſes, of *Camomil*, *Melilot*, and the *Styrax Liquid:* And you may alſo apply Wine, in which have been boil'd before all the Aromatick Plants, which are apt to ſubtiliſe and rarify the extravaſated Humour.

In the Year 1702, being then in the Army of the Duke of *Burgundy*, at the Cannonading of *Nimeguen*, I was preſent at the Dreſſing of one of the *Guard du Corps*, who

who having received a great Contuſion on the Shoulder, that had produced a great *Echymoſis*. This Contuſion was occaſion'd by a Cannon-Ball, which as it was grazing had taken away a Piece of the Patient's Coat and Shirt, and had made ſo violent a Contuſion on his Shoulder, that he had ſcarce any Senſation remaining in that Part. I ordered ſome Scarifications to be made very deep to the Quick, and within them conveyed ſome *Aquavitæ*, in which ſome Salt had been diſſolved before. I afterwards continued to dreſs the ſame Contuſion at *Cleves*, where the Hoſpital of the Army was fixed at that Time, and he was perfectly well cured.

In caſe the Contuſion is of ſuch a Nature as to threaten a Gangrene or *Sphacelus*, you muſt open it, the ſooner the better, by making ſeveral Inciſions, as well to remove the exceſſive Tenſion, as to diſcharge the Part of the Blood and Seroſity, which ſuppreſſes, and as it were ſtifles the natural Heat.

So that in caſe the Extravaſation or Settlement of the Blood is not very conſiderable, 'tis ſufficient to make ſome ſlight Inciſions with the Lancet. If it be more than ordinary, you muſt make deep Scarifications; but if it be exceſſive, you muſt then come to the Slicing of the Part, which muſt be made very deep, and to the Quick.

Within theſe Apertures you muſt put ſome *Spirit. Vin. Camphorat.* or any other Remedies, ſuch as are qualified to revive and animate the Part. Over this you muſt apply a Compreſs, and a Band, ſoak'd in the ſame Spirit of Wine.

Warts are certain ſmall, round, and rugged Elevations or Prominencies ariſing upon the Skin, and more eſpecially upon the Hands of young People. They have their Roots ſpreading under the Skin, which is the Reaſon that they will frequently come out again after they have been taken off before.

'Tis the common Opinion, That theſe Warts owe their Riſe to the Excrements that adhere to the Hands when they are not well cleanſed; and therefore, ſay they, they never are to be ſeen on the Hands of thoſe Perſons who keep them clean, and waſh them every Day.

But the learned Part of the World attribute the Cauſe of the Warts in the nutritious Juices, when they have contracted an Acrimony. They aſſert, That the Warts are nothing elſe but carneous Excreſcencies, cauſed by an Extravaſation of the nutritious Juice, which by its Acrimony corrodes the Capillary Veſſels of the Skin. Some of theſe Warts are very large, others of a middle Size, and others again very ſmall; and theſe laſt appear ſometimes in ſo vaſt a Number, that it is no eaſie Matter to count them.

Some pretend to take off theſe Warts by rubbing them very hard and frequently; others thruſt the Point of a Pin, through them, and putting the Remainder of the Pin into the Flame of a Candle, they cauterize them, and by this Burning them, pretend to make them fall off. Others there are who cauterize them with a red-hot Needle.

But all theſe Ways are very uncertain; and beſides this, are capable of producing Inflammations, and exceſſive Pains. There are Three other different Ways (which far exceed the before-mentioned) of taking off the Warts, *viz.* by tying them, by cutting them off, or by conſuming them.

The Ligature or Tying of them can take Place only in very large Warts, and ſuch as are narrow at the Bottom; and this Ligature muſt be made either with a Horſe's Hair, or elſe with a Thread of Silk. Some I know will dip it beforehand in the Arſenical Water, to make them cut through the ſooner and the better; but this is not without Danger. This Ligature is often made without the Aſſiſtance of a Chirurgeon, and that with good Succeſs.

Some People, who are impatient, and cannot abide to ſee their Hands peſter'd with Warts, are apt to cut them off with Siſſars; but this ſerves only to create Pain, without reaping any Benefit by it, unleſs they apply alſo ſome corroding Medicine, which may eat away the Roots: For the Warts will infallibly come or appear again, and that much bigger than before; and therefore, after you have cut off the Warts, you muſt touch them with ſome *Ol. Tartar. per Deliquium*; or apply to them powder'd *Alum*, or ſome red *Præcipitate*.

The Third Way is, to conſume theſe Warts by the Help of ſuch corroſive Applications as are capable of corroding them, as the Spirit of *Vitriol*, *Aquafortis*, Spirit of Salt, the *Butyrum Antimonii:* But all theſe Remedies muſt never be applied without due Precaution, becauſe they are apt to burn moſt vehemently, and make very deep Eſcars; and therefore you muſt not truſt the Patient with the Management of ſuch-like Remedies by himſelf; but when they are to be applied with Security, you muſt prepare a ſmall Plaiſter, with a Hole in the Middle of the ſame Bigneſs as the Wart is that is to be touch'd with the Cauſticks: Then take with a Straw-Helm, a little of ſome of the corroſive Liquor, and touch the Wart with it; for the Emplaſter, which covers and ſurrounds the Circumference of the Wart, does defend it againſt the violent Action of the *Cauſtick*, in caſe a Drop of it ſhould happen to fall beſides it whilſt you are making the Application; and beſides, this prevents its ſpreading it ſelf, and exerting its Operation beyond the Extent of the Wart.

I have ſeen abundance of Warts taken off only by being touch'd with the Spirit of Salt; and I prefer it to all others, though it be not ſo corroſive; for I think it much ſafer and better to apply it ſeveral Times ſucceſſively, than to run the Hazard of thoſe Inconveniencies, which I have frequently ſeen to have been the Conſequences of the Application of the *Aquafortis*.

This Way of Curing the Warts is doubtleſs the beſt among all the reſt, provided you will take the Pains to manage the cauſtick and corroding Remedies as they ought to be, becauſe they will corrode unto and conſume the Roots; ſo that they will never come again: And this Method more eſpecially takes Place in thoſe Warts which are too ſmall either to be cut, or to be taken off by a Ligature. A common Plaiſter will accompliſh the Cure.

There appear alſo ſometimes on the Surface of the Body certain ſmall Excreſcencies, which have a very narrow Bottom, not unlike unto flat Pearls, which would grow very faſt, if Care be not taken to prevent it. They make their Appearance in all Parts of the Body, but more eſpecially on the Eye-brows.

The require no other Operation but only to cut them off with the Point of the Siſſars; they being ſo ſmall that no Blood enſues, nor do they require any further Dreſſing.

The King has been affected with them ſeveral Times, and were cut off by Monſieur *Felix* after the beforeſaid Manner. The Pain is ſo inconſiderable, as ſcarce to be felt; and the Places where they have been cut off require not any further Aſſiſtance of a Chirurgeon for their Cure.

Monſieur Belloſt, *Chirurgeon-Major to the Hoſpitals of the* French *King in* Italy, *in his* Hoſpital Chirurgeon, *gives us an Account of a new Inſtrument invented by him, in Caſes where Trepannation is uſed, or in other Indiſpoſitions of that Nature.*

HE founds his Opinion concerning the Uſefulneſs of this Inſtrument chiefly upon this:

That by the unanimous Conſent of the ancient as well as the modern Practiſers in Chirurgery, the Air is noxious to all Wounds and Fractures, but more pernicious to the Fractures and Wounds of the Skull; and that therefore a great Part of thoſe Symptoms that enſue upon them, proceed only from the little Care that is taken to hinder the Ingreſs of the Air into the Wounds, whether the Skull be only laid bare, or fractured, or alſo trepanned.

This Inſtrument is a Plate of Lead, very thin and very ſmooth, perforated into Holes in ſeveral Places, without any Aſperities, cut and fitted to the Opening (eſpecially when the *Dura Mater* is uncovered). To make it the more exact, you may sketch it out with the Crown of the Trepan that has been or is to be uſed; or its Meaſure muſt be taken and ſquared according to the Piece cut out by the Trepan. On each Side of this Plate muſt be left a little Ear, ſomewhat longer than the Thickneſs of the Skull. Theſe little Ears are to be bent both one Way,

Way, ſo as that they may be perpendicular to the Plate; and ſo much of them as exceeds the Thickneſs of the Skull is bent outwards again, that thereby they may reſt upon the Skull, and by which you may lift them up with Pincers, if Need be, at each Dreſſing. Theſe Two little Handles may be cut ſomething broader than the Two Pieces that join them to the Plate, which muſt be of an equal Breadth. When you are to apply it, you muſt dip it in ſome proper Remedy pretty warm, and apply upon it a very ſoft Pledgit, or fine Lint.

The ſaid Author mentions Five Advantages, which he ſays do ariſe from the Uſe of this Plate; (which he ſays may be made of Gold or Silver alſo, but he himſelf prefers that of Lead:) *Firſt*, the Matter or Blood contained within the Skull does paſs out of theſe Holes of the Plate, and are imbibed by the ſoft Lint or Pledgit that is laid over it; and if it has acquired any pernicious Quality by being detained there, the Lint, which has ſoak'd it up, keeps it from touching the *Dura Mater*, and imparting the Contagion thereto, and conſequently there is leſs Danger of its undergoing an Alteration.

Secondly, this Plate, by preſſing gently upon the *Dura Mater*, does facilitate the Coming out of the *Matter* or *Blood* that is extravaſated under the Skull.

Thirdly, it does prevent the Generation of a *Fungus*, and the Bunching out of the *Dura Mater* beyond the Skull, which otherwiſe happens very often; in which Caſe we are obliged either to cut off or to conſume with *Catharcticks* that which ſo ſtands out, which ſometimes is attended with very pernicious Symptoms.

In the *Fourth* Place, it hinders by its ſlight Preſſure the *Dura Mater*, in its continual Motion, to ſtrike againſt the Aſperities and pointed Parts of the Skull, that remain after a Piece has been raiſed by the Operation of the Trepan, or entirely ſeparated by ſome external Violence.

Fifthly, it ſecures and preſerves the Brain againſt the pernicious Effects occaſion'd by the Ingreſs of the Air, being in the Nature of a *Succedaneum*, or inſtead (in ſome Meaſure) of that Piece of the Skull that was taken away.

When we have Reaſon to believe, that there is ſome coagulated Blood under the Skull, you may for ſome Time ſuperſede the Uſe of this Plate, in order to give it the freer a Paſſage. And afterward we may uſe it till there be no further Danger of any ill Accidents; and then we muſt quite deſiſt, for fear of hindring the Reunion, and the Generation of the *Callus*. You may ſafely uſe it for Fourteen or Fifteen Days, if there be Occaſion.

When the Operation of the Trepan is performed on the Baſis of the Skull, as is uſual now to be done, this Plate is abſolutely neceſſary here, to ſupport and keep in the Bunching out of the *Dura Mater*; but for the Operation on this Place, as well as for that on others, you muſt, as far as is feaſible, always chooſe the higheſt Part, that the Plate may have the leſs Weight to ſuſtain.

For the further Uſe and Advantages to be expected from this Inſtrument, we will refer the Reader to the Author's *Hoſpital-Chirurgeon*, Chap. XIII. *&c.*

Of Contuſions, *with* Fractures *of the* Skull. *Extracted from Mr.* Wiſeman, *and ſeveral other of the beſt modern Authors.*

A Fiſſure or Crack of the Skull is uſually produced by great Contuſions, either in the ſame Part where the Blow was given, and then it is call'd a *Fiſſura*, or on the oppoſite Part, and then it is call'd a *Contrafiſſura*. The Fiſſures do either penetrate through both the Tables of the Skull, or elſe through one only. If through one only, then either outward or inward, the other *Table* remaining entire. They are diſtinguiſh'd into long, ſhort, wide, narrow, ſtreight, and crooked Fiſſures, *&c.*

Contuſions without a Wound are for the moſt Part accompanied with great Concuſſions, and ſometimes with a Fiſſure, a Fracture, or a Depreſſion of one or both *Tables* of the Skull; in which Caſe the ſpongeous medullary Interval betwixt the Two Tables is frequently broken into its minute Fibres, and ſqueezed together, which occaſions Extravaſation of Blood, and other Symptoms, to be mentioned anon.

Contu-

Contuſions with Wounds are generally attended with Fractures, properly ſo call'd, *i. e.* when a Piece is quite ſeparated from the reſt of the Skull. This Fracture ſometimes does conſiſt of many Pieces, ſome whereof are preſs'd down upon the Membranes; nay, ſome into the Brain it ſelf; while others remain entangled in the Fleſh.

Cuts made by any ſharp Weapon into the Bone by different Ways are call'd *Sedes*, and reckoned amongſt the Fractures; and ſo are thoſe made by a Poleax, Halbert, and ſuch obtuſe Weapons; but thoſe made by a Sword have ſeemed to me Wounds, and not Fractures, becauſe when they do not penetrate the Firſt *Lamina*, or Table, they require no other Cure than that of Wounds, as will be evident from ſome of the following Obſervations; but when the Penetration is deep, I treat it as a Fracture, and upon that Account allow it a Place here.

Out of theſe ariſe ſeveral Species of Compound Fractures, as the *Ecpieſma*, *Cameroſis*, *Eccope*, *&c.* which every Man's Experience will ſuggeſt to him.

According to *Celſus*, in ſuch Caſes as above-mentioned, the Chirurgeon ought to enquire, whether he was ſtunn'd or fell down with the Blow, or vomited preſently after? As alſo, whether he was hurt by a Blow, or by a Fall? Becauſe from the Force of the Weapon, and Manner of the Fall, he may be able to gueſs ſhrewdly at the Caſe. He is alſo to view well the Tumour, and to conſider whether it be great or ſmall. *L. 8. c. 4.*

If there be a Wound, the ſureſt Way to diſcover the Fracture is by the Help of your Finger; for if you feel an Aſperity, you may be ſure it is either a Fiſſure or a Fracture, unleſs it be a Suture.

But even in caſe where there is neither Wound or Tumour, if the Patient be paralitick in any Part, if ſtupefied or delirious, 'tis a certain Sign that the Membranes of the Brain are affected; and if the Hair lie cut in the Wound, you may conclude the Skull to be hurt; nothing but a very violent Force being able to divide the Hair in that Part. I know that ſome Authors do lay ſome Streſs upon the holding a Thread between the Teeth, or biting a Cruſt, in order to diſcover a Fracture; but unleſs the Fracture be near or under the Temporal Muſcle, I cannot judge this Sign to be of any great Conſequence.

All the Wounds of the Head, though never ſo ſlight at firſt Appearance, are dangerous, if we may believe *Hippocrates*; but by how much nearer they penetrate to the Brain, ſo much the more dangerous they are; and all the Contuſions of the Head are ſuſpected as being attended with the moſt pernicious Symptoms.

If in laying open the Skull, the Patient recovers not his Senſes, you may very well ſuſpect an Extravaſation of Blood under the *Dura Mater*, and then the Life of a Patient is in great Danger. Fractures made by Gun-ſhot do moſt frequently beat Pieces of the Skull into the Brain, and then are accounted with good Reaſon mortal: However, if the Hurt penetrates not farther than the *Dura Mater*, there is Hopes of a Cure, if it be laid open in Time, and dreſs'd as ſhall be ſhewn hereafter.

In Wounds made by Contuſion, where the Skull is a little naked, you muſt have Care not to over-crowd it immediately with Doſſils; for when the contuſed Fleſh is once well digeſted, the Bone will incarn underneath with the Wound without much Difficulty. I have incarned in theſe Caſes with good Succeſs, and that in the worſt Habit of Body, by keeping the Orifice a little open by a ſmall Doſſil ſqueez'd out of *Spir. Vini*, and defending the circumjacent Parts from Fluxion by proper Remedies and Bandage; for if the *Matter* be ſhut in by the Dreſſings, the Wound will be made more ſinuous, and the Cure be protracted: To prevent which, I have ſometimes applied a Compreſs round it, with a Hole in the Middle, to give Vent to the Matter, whilſt the Parts above incarned by Compreſſion.

But if the Contuſion caſts off a Slough, and leaves the Skull much naked, though there be no Corruption in the Bone either by the Matter or the Air, yet there will be a Neceſſity to raſp it.

For the Bone being naturally ſmooth and ſlippery, the Fleſh will difficultly grow upon it; and therefore to haſten the Cure, you muſt raſp the Bone thin, till you ſee the Blood ready to come out of it. But if your Patient is againſt Raſping, then you muſt keep

keep your Doſſils cloſe to the Lips of the Wound, and make the Exfoliation from the Edges, that the ſound Part may thruſt off the rotten Bone; for neither Crabs-Eyes, nor any other internal Remedy, nor any outward Applications of Wine with Lint, or any other Medicines to the middle of the Bone, will ſignify any Thing to the Exfoliation of it; and while you are ſpending your Time that Way, will rot the Bone underneath, and in Progreſs of Time will penetrate the firſt *Lamina* or *Table* of the Skull, and run down between the two *Tables*, and ſo put you upon the Operation of the *Terebra*.

After the Bone is raſped or ſcraped, you may then dreſs it with Pledgits in *Liniment. Arcei* hot, if it require Digeſtion otherwiſe; apply them preſt out of *Spir. Vini*, either ſimply, or ſuch wherein hath been infuſed *Pulv. Rad. Circos. Ariſtoloch. Paucedon.* &c.

In caſe in a Wound of the Head the Skull be cut ſlanting off by a Sword, *&c.* or into the Second Table, if there be no Symptoms of Concuſſion, you ſhall not lay open the Wound to apply the *Terebra*; but cleanſe and then dreſs it up with a proportionable Doſſil, preſſed out of *Spir Vini*, and digeſt the Lips of the Wound, and attend the Exfoliation, and then heal it. I know that ſome are for the raſping of theſe Bones alſo, but I think it needleſs here; for if the Bone be dreſſed as you have been directed, the Fleſh will ſoon come forth in that Cut of the Bone, make Exfoliation, and incarn it, without any further Trouble.

If the Skull be hurt by a ſharp cutting Weapon, it can't be done without a Solution of Continuity in the Hairy Scalp; but by a Fall or Blow the Skull may ſuffer a Fracture or a Fiſſure, tho' the hairy Scalp remain entire; and this Fracture or Fiſſure may either be under the Contuſion, or in ſome other Parts.

If the Symptoms give you ſufficient Reaſon that there is either a Fracture or a Fiſſure, you muſt then without Delay open the Hairy Scalp, either regularly, or in the Form of a Croſs or of the Letter T, according as the Part will beſt admit of, in order to diſcover the Fracture by the raiſing of it up with its *Pericranium*: For if in doubtful Fractures or Fiſſures you ſhould make a circular Inciſion, and take out the whole Piece, then, if there be no Fiſſure, you have cut out a long Piece of Work for your ſelf to little Purpoſe; or if there be a Fiſſure which runs under the Hairy Scalp farther than you made your Inciſion, you muſt after that be obliged to cut it open that Length; ſo that it will be apparent, that by Miſtake you have laid open more in one Place than was neceſſary, and too little in another: Whereas if you had laid it open by an Inciſion after the Manner of a Croſs, you might, by only raiſing the Scalp, have diſcovered the Fiſſure or Fracture; and in caſe as yet ſome Part of the Fracture or Fiſſure had remained undiſcovered, you might eaſily have extended your Inciſion to it. And after all, if there had been no ſuch Thing as a Fracture nor Fiſſure, which often happens, eſpecially in Caſes of *Contrafiſſuræ*, or Contrafiſſures; then the Hairy Scalp might have been laid down again, and eaſily cured, which is not to be done by an Exciſion of Part of the Scalp.

Some are apt to alledge againſt this, that the raiſed-up Lips will prove troubleſome to the Chirurgeon, and painful to the Patient; but if the Inciſion be made the Way propoſed by the Antients, and that the Fracture or Fiſſure be all in your View, 'tis in your Power to order the Lips of the Wound as you ſee convenient.

After the Skull is laid bare, you muſt fill up the Place you have opened with Doſſils of dry Lint, or preſſed out of red Wine, or *Oxycrate*, or a Sponge preſſed out of either of the ſame Liquors, and over all apply a Plaiſter of *Diachalcit.* malaxed with *Ol. Roſ. cum Aceto*, and then bind it up.

At the next Dreſſing you muſt take Care of the Fiſſure. If it be ſo ſmall, that you are dubious whether it be actually a Fiſſure or not, then wet it with Ink, and then wipe it off again, and the Ink will ſhew you where the Fiſſure is; but if it ſhould not, then you may apply the following Emplaſter.

Rs. *Ceræ novæ flavæ, Thuris, Ladani, ana Unc.* ij. *Farin. Fabar. Terebinth. Aceti, ana Unc. j. miſc. ad Ignem.* This you muſt apply to the ſuſpected Part, and the next Day, where you find it moiſt, there you are to rugine or raſp it.

Fal-

Fallopius tells us, that where the Skull is contuſed, certain Spots will appear red, not unlike thoſe white ones which are uſually obſerved in the Nails of the Fingers; but after the Third Day that Redneſs diſappears, the Blood being then exhaled.

If you diſcover the Fiſſure, or that the Bone contuſes, you muſt raſp the contuſed Part the whole Length; for which Purpoſe you ſhould be provided with divers Sorts of Raſpatories; and whilſt you are performing your Operation with them, let the Lips of the Wound be covered with ſome ſoft Linnen, that you neither hurt them, neither the Air offend them.

Small Fiſſures prove oftentimes mortal, tho' they ſeem but inconſiderable at firſt; becauſe there happens frequently an Extravaſation of Blood; the Veins being broken either by the Concuſſion from the Blow, or by the rugged Edges of the inner Table of the Skull. 'Tis upon this Account that you are very well to weigh the Symptoms, and accordingly open the Wound either by Raſpatories or otherwiſe cutting into it, ſo as the *Sanies* may be diſcharged, and the Aſperity removed.

But in caſe of a Fracture of the Skull, you ought to ſatisfy your ſelf, whether it be penetrated into one only, or into both *Tables*. If in both, then whether the Depreſſion of the Bone be great, and what Fiſſure there is, and accordingly open a Way to relieve the *Dura Mater* underneath; for this is never without pernicious Symptoms, as Inflammation, Fever, *Delirium*, which are followed by *Aloma*, Convulſions, Palſies, and Death, if neglected.

But if there be a Fiſſure ſufficiently large to diſcharge the Seroſity, you have little more Time to conſider of the laying it open, or raſping the Bone; but if it be otherwiſe, you muſt have Recourſe to the Trepan, to give Vent to the *Serum*, and make Way for the raiſing of the depreſſed Bone. But if you find the Bone not much depreſſed, and the Fiſſure pretty large, it is then in your Choice, whether you will inlarge that Fiſſure, or continue it for Evacuation of the Matter, and forbear the Application of the Trepan; for a ſmall Depreſſion of the Bone will either riſe, or caſt off by the Benefit of Nature.

I am ſenſible this will not be reliſhed by ſome Chirurgeons, who are immediately for the Trepan upon all ſuch-like Occaſions, becauſe I my ſelf have been obliged to comply with them in this Reſpect, notwithſtanding the Fiſſure was ſufficiently large when the ill Symytoms were remitted, and where there was no Depreſſion of the Skull; but it had better been let alone, unleſs the Fiſſure had lain untowardly for Diſcharge of the *Matter*, or the Depreſſion of the Skull had been deep; for there a Trepan ought to be applied in Time.

Before you proceed to the Operation it ſelf of the Trepan in the Skull, the Bone muſt be cleanſed of its *Pericranium*, leſt in ſetting on the *Terebra & Mediolus*, or the Trepan, you tear the Membrane, and the Lips of the Wound ought to be covered alſo the while. The *Terebra* muſt be fixed on that Side which is moſt depending, and if there be a Depreſſion, make the *Terebration* or Perforation ſo near, that you may afterwards be able to raiſe up that by it.

When you have fixed your Trepan, preſs upon it with your Left Hand, and turn it round with your Right. You muſt make Uſe of a little *Ol Roſ.* or Milk, to make it move the eaſier, and, as it fouls, bruſh it; in doing of which it will cool.

Before you approach to the Second Table, (which will ſhew it ſelf by the Blood that appears) you muſt take out the Pin, and proceed with more Caution, often lifting up your Hand, leſt by your Compreſſion or Haſt you unawares fall upon the *Dura Mater*, and wound it. Some Chirurgeons are very apt to bring out the Bone in the Bore; but the ſafeſt Way is to raiſe it with your Levator, when it is ſo cut, that it is but lightly retained in ſome Part. Some adviſe to ſtop the Patient's Ear with Lint, leſt the Noiſe diſturb him, and the Room muſt be very cloſe.

The Perforation being made in the Skull, and the Bone taken out, you are to ſmooth away the Aſperity which remains in the interior Table by the lenticular Inſtrument made for that Purpoſe; and if, after this, the Membrane be fouled by the Sawduſt of the Bone, you muſt wipe it off with a ſoft Sponge, or a little Lint upon your Probe;

and ſo ſoon as the Part is cleanſed, you muſt begin to dreſs up the Membrane.

There is no ſmall Conteſt among the Authors about this firſt Dreſſing or Application; for *Avicen* dreſſed them with Lenients, but *Celſus* ſprinkled the Membrane with ſharp Vinegar, as well to prevent the Bleeding, as to diſſolve the concreted Blood lodged upon the ſaid Membrane or *Dura Mater*. But the greateſt Parts of the Ancients, and many among the Moderns, follow *Avicen*, and are for Lenients, as the *Ol. Roſ.* that ſo the extravaſated Blood lying upon the *Dura Mater*, may be digeſted or turned into *Matter*.

In this Caſe your own Eye muſt be your beſt Guide, for if there be a *Sanies* or Putrefaction, *Mel. Roſ. cum Spir. Vini*, and higher Detergents, may be uſeful, according as you find the Putrefaction to be more or leſs; but if there is much Blood extravaſated, or you have Reaſon to fear a Bleeding, you may follow the Advice of *Celſus*. If you obſerve the Blood to be recent, and only in a ſmall Quantity, it may poſſibly ariſe from a Scratch made by the Trepan, or by ſome ſmall Aſperity of the interior *Table* of the Skull.

If you obſerve neither of theſe, but the Membrane of its natural Colour, then you ought not to trouble this Membrane, now expoſed to the Air, with Detergents, or ſharp Medicines, ſuch as Vinegar; for if by ſcratching of the Membrane you make it bloody, and then dreſs it either with *Acet.* or *Mel. Roſ. Spir. Vini, &c.* you will act contrary to the common Indications in Chirurgery, which teacheth to digeſt recent Wounds before you deterge.

Hence it is that I adviſe you to Lenients, not only upon the Authority of many of the ancient and modern Chirurgeons, but by my own Practice alſo. *Galen* preſcribes *Sang. Columb.* and the Blood of Turtles drop'd warm from their Wings; but *Fallop.* and *Aquapend.* adviſe to the Uſe of *Ol. Roſ.* with *Reſin. abietis*, and afterwards they encreaſed the Reſin, and leſſened the Oil. But if there be Putrefaction, thro' the long lying of concreted Blood, *&c.* then *Mel. Roſ.* and *Spir. Vini* are very uſeful; yea, *Mel. Ægyptiac.* and higher, if Occaſion ſhall require.

But in the common Caſes, after recent Terebrations, Reſin, by its Emplaſtick Quality, mix'd with *Ol. Roſ.* perfects the Concretion ſooner, and, by its anodyne Virtue, ſecures the Part from Inflammation; but it muſt be proportioned to the Conſtitution of the Patient, dry Bodies requiring more of the Reſin, and leſs Oil.

By this ſimple Remedy I never failed of a good Digeſtion, and afterwards, by the tempering of it, as I have ſaid, I have deterged and digeſted, without any the leaſt Prejudice to the Bone perceived from it.

But after all, you muſt be cautious that you do not apply Digeſtives unſeaſonably, for Fear of relaxing the Parts; therefore, after Digeſtion, add more Reſin and leſs Oil: Or elſe, you may mix *Mel. Roſ.* with the Reſin inſtead of Oil, which will ſerve both to deterge and incarn: Or elſe, you may make Uſe of the next following Preſcription to both theſe Purpoſes:

Rs. *Terebinth. Venet. Unc.* j. *Ol. Roſ. Unc.* iv. *Mel. Roſ. Unc.* iij. *Croci, Scrup.* j. *Granor. Kermis, Unc. ſem. ſem. Hyperici, Scrup.* ij. *Vini Hiſpanic. Unc.* iij. *coq. ad conſumpt. Vini colatur: Adde, Aloes Drachm.* j. *miſc.*

Theſe Remedies may be applied upon the *Dura Mater*, and a Button of Lint over, to fill up the Hollowneſs in the Bone; the reſt of the Bone may be dreſſed with dry Lint, or *Liniment. Arcei*, and the Lips of the Wound with a Digeſtive as aforeſaid, *cum Terebinth.* over which apply *Empl. Diapalm.* malaxed with a little *Ol. Roſ.*

In the Application of theſe Remedies, you muſt conſider both the Part and the Conſtitution of the Body, and proportion your Ingredients according as you find Occaſion to deterge or incarn, *&c.* and ſo they will anſwer all Intentions. I know that ſome Authors have been very careful in limiting the Times to dreſs with this or that Medicament; to wit, to make Uſe of Digeſtives to the Fourth Day, to deterge from thence to the Seventh, and then incarn to the Fourteenth Day. But this muſt be left to the Judgment of the Chirurgeon, who ought always to take Care to cheriſh the native Heat.

In caſe the Wound penetrates to the *Dura Mater*, you muſt conſider the Weapon, and

not delay to relieve the Parts under the Skull. Thus when Fractures are made with Bullets or Slugs, and the Hairy Scalp and Pieces of the Skull are beaten in together upon the *Dura Mater*, you muſt immediately lay open the Hairy Scalp, and raiſe it up with the Bones, for the Relief of the oppreſs'd Membrane.

If there be a great Flux of Blood, cleanſe it with a Sponge dip'd in Red Wine or Vinegar, and dreſs it as has been ſhewn before. If the Opening in the Skull be not ſufficiently large, make one in the declining Part, raiſe up the Bones, and free the Membrane from whatever is offenſive to it. Don't be too forward in taking out of Bones, but take out no more than needs muſt; for recent Fractures of the Skull will frequently unite like thoſe in other Parts, if the *Matter* hath Liberty to diſcharge from within. Therefore, after you have raiſed up the Bones that are looſe, dreſs the others dry with Categmaticks, *&c.* and take Care they be not overſpread with looſe Fleſh, and they will agglutinate.

It happeneth ſometimes in great Contuſions, that after the Hairy Scalp is laid open, and that there is no Appearance either of Fiſſure or Fracture, and yet there is a Neceſſity of making a Perforation in the Skull, for the preſent Relief of the Patient of a *Coma* or *Paralyſis*; but if, notwithſtanding, theſe Symptoms do not remit, you may with good Reaſon conclude or ſuſpect, that the extravaſated Blood lieth deeper; for in great Contuſions, the Extravaſation of Blood lieth betwixt the *Dura* and *Pia Mater*, and ſometimes amongſt the Ventricles of the Brain.

In theſe Caſes, if the Patient finds no Relief by the Terebration or the Perforation, an Aperture muſt be made through the *Dura Mater*, and if the Blood lie between it and the *Pia Mater*, it may be diſcharged; and how it is to be dreſſed, I ſhall ſhew anon: But for the moſt Part the Brain will contract a *Sphacelus* by the long Retention of *Matter*; and then, as the Patient does ſuffer from the Beginning under the ſevereſt Symptoms of *Coma* or *Paralyſis*, ſo he is carried off by Convulſions.

In theſe Wounds of the *Dura Mater*, the Lenients of *Ol. Roſ.* or warm Pigeons-Blood are proper; they are anodyne, and diſgeſt. *Ol. Hyperici* and *Maſtich* are good alſo mix'd with Reſin *Aquapend.* after *Galen*, adviſes the Dreſſing of theſe Wounds with *Succ. Calaminth.* and afterwards ſprinkling *Pulv. Millii* on the Membrane to incarn it, the *Millium* moderating the Heat of the other.

The Unition and Incarning of the Lips of the *Dura Mater* is performed by a fleſhy Subſtance, which ariſing upon the Membrane, afterwards, as it increaſed, unites them together, and overſpreading that Part, groweth up to the Skull, and unites with that *Callus*, (after Exfoliation of the Bone) and becomes one Body with it; filling up that hollow Part that was perforated, and in Time will become more firm than the Bone it ſelf.

But Care muſt be taken, that theſe Lenients don't render the Fleſh too lax by their Greaſineſs, which will produce a troubleſome fungous Fleſh. This in the Beginning may be prevented by Deſiccations, and waſted by *Merc. Præcip. Pulv. Cort. Granat. Balauſt. Roſ. Rub.* or *Alumen uſtum* alone; but if it grows very big, you muſt take it off by a Ligature.

But as I never met with any ſuch-like Diſturbance as is repreſented to us by the Author, ſo will not you, provided you make Uſe of your Deſiccatives in Time: For the Vitriol Stone will take this off with little Pain, and diſpoſes the Part to cicatrize if it be uſed timely, but with Moderation.

The *Pia Mater* adheres ſo cloſe to the Brain, that it can ſcarce receive any Hurt without the Brain being wounded at the ſame Time, which moſt commonly proves mortal; becauſe this Membrane is full of Veins, and conſequently ſubject to great Effuſion of Blood; as alſo, becauſe being expoſed to the Air, it will ſoon contract a Corruption, and become fluid; ſo that it is thruſt forth by the Contraction of the *Meninges*, or Membranes, which are irritated by the continual Pain they ſuffer from the Corruption of the Brain.

So

So long as any Thing remaineth in that Ventricle, you muſt make Way to theſe Wounds, by removing the ſhattered Fleſh and Bones; but if they will not come eaſily away, leave it to Nature, for fear the Patient dies under your Hands.

Your Dreſſings muſt be made with *Galen's* Powder and Hares-Fur, *cum Album Ovi*, upon Pledgits, in order to reſtrain the Bleeding, and retain the Brain within Bounds. Over theſe apply your Dreſſings, in the ſame Manner as in the Wounds of the *Dura Mater*: But don't neglect in all theſe Gun-ſhot Wounds to cut off the ſhattered Lips of the hairy Scalp, leſt ſome Gleeting drops from them upon the Membranes of the Brain, and heighten the Symptoms.

The Brain being retained within its Membranes, and the *Pia* and *Dura Mater* digeſted and incarned, you muſt then in the remaining Part of the Cure proceed as in the Fractures of the Skull.

In all Hurts of the Head, Evacuation is required, eſpecially if there be any Signs of a *Plethora* or *Cacochymia*, to prevent ill Accidents. Therefore you ought in Time to adminiſter Phlebotomy in the Neck or Arm on the ſame Side, and reiterate it according to the Exigency and Strength of the Patient.

Cupping alſo, with or without Scarification of the Neck and Shoulders, with Iſſues under the Ears, is uſeful: Then lenient Purgations, ſuch as will evacuate the ſerous Blood, which is apt to fall upon the affected Parts. For theſe Purgatives, I refer the Reader to thoſe that have been propoſed in the Fourth Intention of the Wounds in general.

Cordial Spices and Electuaries may be of Uſe alſo, provided they be adapted to the Temperature of the Body and Symptoms; and if there be a Fever, Juleps and Emulſions are required.

Vulnerary Decoctions are alſo very proper ſometimes, if they are well proportioned to the Nature of the Part. The Ingredients for them are: *Beton. Artemiſ. Caryophill. primula Veris, Lilium Convallium, Salvia Hyperic. Sanicul. Veronica, Plantag. Flor. Roſ. rubr. mec. moſhat. &c.* Of theſe you may make a Decoction with Wine and Water, or ſmall Ale. Or elſe,

Rs. *Sanic. Beton. Veronic. Artemiſ. ana Unc. j. Conſerv. Roſ. rubr. Caryophill. Unc. ſem. Tormentill. Drachm. ij. coq. in Aqua Fontan. & Vin. Rhenit. lb. ij. vaſe clauſo in B. M. colentur per Manic. Hippocratis.*

Or take a few of each of theſe Plants, well dried and cut; boil them, and then ſweeten the Decoction with Honey or Sugar to the Palate of the Patient. Of this let him drink a Diſh twice or thrice a Day.

You may, if you pleaſe, aromatize this laſt Decoction with Sanders, *Caſſia Lign. &c.*

As to the External Applications to be made to the Fractures of the Skull, though moſt of them have been ſet down before, yet I will inſert here a ſhort Repetition of the juſt Application of them, that the young Chirurgeon may not ſtagger in the Method propoſed here.

In caſe the Skull be fractured, lay it bare by Inciſion; and raiſing up the hairy Scalp, fill the Wounds with Doſſils, and apply over it the Cataplaſm of *Hippocrates*, or ſuch-like, embrocating *cum Ol. Roſ. &c.* as hath been ſaid. At the Second Dreſſing digeſt it with *Ol. Roſ. cum Reſina*, as before hath been directed: But if it be ſanious, deterge with *Mel. Roſ. Spir. Vini, &c.* as Occaſion offers, and dreſs the Lips of the Wound of the hairy Scalp with this or the like.

Rs. *Terebinth. lot. in Aq. Salv. Unc. j. Ol. Roſ. Unc. j. ſem. Gumm. Elemi cum Oleo ſuper Ignem ſolut. & colat. Unc. ſem. Croc. Pulv. Scrupl. j. Vitell. Ovi, Drachm. j. miſc.* By the ſpeedy Digeſtion of the Wound, you will certainly accelerate the Cure.

After Digeſtion, *Spir. Vin.* is very uſeful, by reaſon of its drying Quality, applied either alone upon Lint, or elſe mix'd with *Mel. Roſ.* or *Syr. de Roſ. Sicc.* Or elſe you may make Uſe of this following:

Rs. *Spir Vin. Unc.* vi. *Myrrhæ, Unc. ſem. Aloes, Unc j. Sarcocoll. Thuris, ana Drachm.* ij. Or this Balſam:

Rs. *Spir. Vini*, lb. j. ß. *Vin. Malvatici, Unc.* xvi. *Myrrh. Thuris, ana Drachm.* x. *Pulv. Rad. conſolid. Unc. j. Pulv. Centaur. min. Unc. j. ß. Flor. Hyperic. Pulv. Unc. ſem. Terebinth.* lb. ß. *Infunde in Balneo M.* Apply it warm upon the Membranes.

In caſe the *Dura Mater* has changed its Colour, and do not deterge with the before-

ſaid Remedies, then *Terebinth. lot. in Vin. alb. Unc.* iij. *Mel. Roſ. Spir. Vini. ana Unc.* j. *Myrrh. Aloes, Sacchar. alb. Unc.* ij. *miſc. S. A.*

But if theſe Wounds tend to a Putrefaction, ſcarify the Lips of them, and apply the following, or ſuch-like:

Rs. *Mithridat. Drachm.* vi. *Theriac. Venet. Drachm.* ij. *Mel. Ægyptiac. Drachm.* j. *Pulv. Scord. Myrrhæ, ana Scrupl.* j. *Spir. Vini q. ſ.*

After the Putrefaction is removed, you may then dreſs with *Ol. Terebinth. Venet. Mel. Roſ. p. æqual.* applied warm.

All theſe before-preſcribed Remedies muſt be applied to the Membranes upon a Sindon.

A Sindon is a Piece of Silk or fine Linen, cut round proportionably to the Perforation or Aperture made in the Skull. It muſt be placed under the Edges of the Skull by the Lenticular Inſtrument, to prevent theſe Edges of the perforated or fractured Skull from preſſing upon and hurting the *Dura Mater.* You muſt faſten a Thread or Silk to it, to pull it out as often as you have Occaſion. Over it you muſt apply ſoft Doſſils or Lint, to fill up the vacant Space in the Skull, that ſo you may keep the *Dura Mater* from ſtanding out above it.

In the Wounds of the Membrane of the Brain, and of the Brain it ſelf, make Uſe of the following:

Rs. *Succ. Beton. Unc.* iv. *Succ. Calaminth. Unc.* ij. *Flor. Centaur. min. P.* j. ß. *Hyperic. contuſ. Drachm.* ij. *Vini odoriferi,* lb. j. Infuſe theſe for Three Days; then boil them to the Conſumption of the Juices, ſtrain it, and add to it, *Terebinth. claræ, Unc.* iij. *Gumm. Elemi diſſol. in Spir. Vini, Unc.* ij. *Ol. Hyperici, Unc.* jß. *Mell. Roſ. Drachm.* vi. Boil theſe a little; then add *Pulv. Myrrhæ, Aloes, Sang. Dracon. Thuris, ana Drachm.* j.

The *Oleum Hyperici,* as preſcribed in Wounds in general, is an excellent Remedy in recent Wounds of the Membranes of the Brain.

Fabricius ab Aquapend. preſcribes this in the Wounds of the Brain:

Rs. *Far. Millii, Unc. ſem. Ol. Hyperici, Unc.* j. *Mithridat. Drachm.* vi. *Balſam. Peruvian. ex Ægypto, Drachm.* iij, *Spir. Vini. Drachm.* v. And if it requires to be more deſiccant, he adds a little *Ol. de Chalcanto.* Drop this (ſaith he) warm, and your Digeſtives over the Wound; then embrocate the Head and circumjacent Parts with *Ol. Roſ.* and apply the following Emplaſter over all:

Rs. *Far. Hord. Unc.* viij. *Pulv. Cham. Unc.* iv. *Pulv. Spicæ, Schænarth. ana Drachm.* iij. *Pulv. Beton. Stœchad. ana Drachm.* ij. *Ol. Maſtich.* lb. ß. *Ol. Roſ. Unc.* iv. *Oxymel. ſimpl. Unc.* v. *Vini alb. potent. q. ſ. fiat Emplaſtrum.*

In caſe the Bone be carious, and yet will not exfoliate, you muſt rugine it, and dreſs it with *Liniment. Arcei.* If that proves too relaxing, then,

Rs. *Spir. Vini, Unc.* x. *Myrrhæ, Unc.* j. *Aloes, Unc.* j. ß. *Rad. Peucedan. Ariſtoloch. cort. Thuris, ana Unc. ſem. pulveriſ. & miſc. pro uſu.* Apply it upon Doſſils.

In very dry Conſtitutions, make Uſe of the following:

Rs. *Pulv. Aloes, Pumic. uſti pomphol. ana Drachm.* ij. *Myrrhæ, Drachm.* j. *Pulv. oſtr. combuſt. Scrupl.* ij. Mix them with *Mel Roſ. & Spir. Vini,* and apply the following Emplaſter over all:

Rs. *Ceræ Reſin. pin. Gumm. Ammoniaci, Elemi, ana Drachm.* vi. *Terebinth. Unc.* iij. *Pulv. Myrrhæ, Maſtich. Ariſtoloch. rotund. Ireos, Aloes, Opoponac. Euphorb. ana Drachm.* j. *Ol. Roſ. q. ſ. fiat Emplaſtrum.*

After the Wound is incarned, you may proceed to the Cicatrizing of it with one of theſe, or ſuch-like:

Rs. *Plumbi uſti cum Sulphur & loti, Litharg. Aur. ana Unc.* ij. *Antimon. uſt. & lot. Ceruſſ. ana Unc.* j. *Ol. Roſ. fiat Unguentum.*

Or,

Rs. *Calcis Putaminum Ovorum calcinat. Unc. ſem. Alum uſt. Drachm.* j. *Croc. Martis, Unc.* j. *f. Pulvis.*

Theſe are the Remedies out of which you may chooſe, according to the Circumſtances and Exigency of the Caſe. I will now add a few Inſtances, to ſhew you the true Application of them.

An Account of a Concuſſion, with a Fractur'd Leg.

A Gentleman of about Thirty Years of Age was beaten off his Horſe, and lay ſtunn'd on the Ground. A Barber-Surgeon was fetch'd immediately; but I being ſent to him ſoon after, I found his right Brow bruiſed,

bruiſed, and his Pulſe oppreſſed. Being told by the Chirurgeon, that he had open'd a Vein in his Arm, but that it would not bleed, I replied, that we muſt make him bleed; and eſpying the Jugular Vein on the bruiſed Side turgid, I open'd it, and he bled freely.

After I had taken about Twelve Ounces, the Blood ran down from his Arm alſo where it had been open'd before; ſo we bled him till he came to Life, and then he raved and ſtruggled with us. The Bleeding being ſtopp'd, and he put into a Bed, he roar'd all the while, eſpecially as they were pulling off his Stocking from his Right Leg; which upon a more near View we found broken ſhort in the Middle of the Thigh-Bone, cloſe by a bony Wen of the Bigneſs of a Tennis-Ball; ſo we endeavoured to ſet the Fracture, but the Patient oppoſed us both in the Setting and Dreſſing of it up; yet by the Help of ſome People who kept him down, we ſet and dreſs'd it as is ſhew'd in the Simple Fractures; but he ſoon looſen'd the Bandage again, ſo that we ſaw our ſelves neceſſitated to leave the Leg unſet.

We prepared Applications for his Head, ſhaved the Hair from that Side of the Temporal Muſcle, embrocated the Part which ſeem'd to us affected *cum Ol. Roſ. & Aceto*, and applied a Cataplaſm of Bean-Meal boil'd with Oxymel, he permitting it patiently.

The next Day Sir *Charles Scarborough* and I went to viſit the Patient, whom we found raving, and underſtood that he had done ſo all Night. His Pulſe was low and intermitting, and upon that Account Venæſection was deferred; but the Phyſician preſcribed what elſe he judged neceſſary.

His Bruiſe being upon the Temporal Muſcle, which ought not to be laid open upon a bare Surmiſe, we renewed our Embrocations and Cataplaſms: And returning the next Day, I found my Patient raving as I left him; ſo that now ſuppoſing his Diſtemper proceeded from an Inflammation of the Membranes of the Brain, I adminiſtred Venæſection on the ſame Jugular as before. I took away Ten Ounces of Blood, and ſo continued every Day, or every other Day at leaſt. I found the Patient's Pulſe riſe. He ſlumber'd ſometimes, and took ſome Nouriſhment, which before he did not. About the Seventeenth Day, when I was in Hopes of ſetting his broken Thigh-Bone, (becauſe, as I was told by my Aſſiſtant, he was grown more ſenſible of it) I found him, to my great Surprize, raving as much as ever; which put me to no ſmall a *Nonplus* what to reſolve upon; for I had been much blamed for letting him Blood ſo often: However, having declared to them the Neceſſity of another Venæſection, and that after this I would bleed him no more, I open'd the ſame Jugular, and let him bleed till I obſerved his Countenance change, and then gave him a little Cordial Julep to refreſh his Spirits, and ſo left him pretty hearty.

Upon my Return the next Day, I found him, to my great Surprize, perfectly well in his Senſes. We then preſently prepared for the Setting of his broken Thigh-Bone, which we found without Inflammation, Tumour, or Pain, notwithſtanding it had remained unſet now for above Seventeen Days. I ſuppoſe the *Callus* was thruſt out at the fractured Ends of the Bone, and had covered the Aſperity of them, a ſufficient Revulſion and Evacuation having been made by the Diſeaſe and reiterated Phlebotomy. We brought the Ends of the Bone together by an eaſie Extenſion, dreſs'd it up as is uſual in ſimple Fractures, and within Twenty Days the *Callus* dried; ſo that his Leg was ſtrong enough to bear him, and in ſome Weeks after he was in a Condition to go abroad.

An Account of a Fracture, with a long Fiſſure and Depreſſion of the Skull.

A Youth of about Ten Years of Age having received a moſt violent Blow on his Forehead with a Cudgel, I was ſent for, and found him deprived of his Speech, and the Uſe of his Legs. There was no Wound nor conſiderable Swelling, but with my Fingers I could feel a Depreſſion of the Bone; and thereupon, with Conſent of the Parents, ſent for a Chirurgeon dwelling at the next Door, who had applied the Firſt Plaiſter, and deſired him to take the Patient into his conſtant Attendance.

I cauſed his Hair to be ſhaved off, and made an Inciſion ſo large, as to be able to apply the Trepan, if Neceſſity ſhould require, for the raiſing up the depreſs'd Bone: But in dividing the hairy Scalp towards the *Sutura Coronalis*, I diſcovered a long Fiſſure, running up from the Fracture of the Bone beyond my Firſt Inciſion; ſo I was obliged to lay the Fiſſure more open, out of which a Quantity of ſerous Blood did flow immediately, and the Depreſſion was a Piece of Bone as broad as a Three-Pence, ſunk under the Skull.

I filled up the Opening with Doſſils of dry Lint, and over all applied a Digeſtive of *Terebinth* and White of Eggs upon Pledgits, and *Empl. e Bolo* with Bandage to keep them on.

The next Day, in the Preſence of Two Phyſicians and another Chirurgeon, I took off the Dreſſings, and applied the *Terebra* or Trepan above the fractured Bone, by reaſon of the Poroneſs of the Bone below. The Bone being taken out by the Help of the *Terebra*, and the inner Edges ſmoothed by the Lenticular Inſtrument, I put in the Levator, and raiſed up the depreſs'd Bone even with the reſt. That done, I placed in a Sindon dipp'd in *Ol. Roſ.* with a Third Part of Reſin: Then with a Doſſil filled up the Bone: After this opened the Fiſſure with my Rugines, and ſcraped off its Edges, that no *Sanies* might be detained, and then dreſs'd up the Bone with *Liniment. Arcei*, warm, ſo as to give Way to the Lips to fall in; I being for no more Opening than what was abſolutely requiſite for the Diſcharge of Matter from within. Over theſe Dreſſings I applied *Empl. Diachalcit.* malaxed with *Ol. Roſ.* and Vinegar, and with Compreſs and Bandage made an End of the Second Dreſſing.

From that Day all the Symptoms that threaten'd us before diſappear'd; for the Firſt Opening, and Letting of Blood the ſame Night, recovered his Speech; and the Uſe of his Legs was reſtored alſo after this Dreſſing. I continued him to a dark Room and a ſlender Diet, without Fleſh. The internal Medicines were ordered by a Phyſician; and I continued the ſame Way of Dreſſing for Four or Five Days; when Digeſtion being made, I added *Mel. Roſ.* inſtead of the Oil, and afterwards incarned, by encreaſing the Reſin, and leſſening the Honey, the Fleſh ariſing in little Grains. Preſently after the Digeſtion was accompliſhed, and in a few Days more cover'd the *Dura Mater*.

I accelerated the Exfoliation of the Bones by the Application of the *Tinct. Myrrh.* and deterged the wounded Lips with *Mundific. Paracelſi.* To keep down the luxurious Fleſh, I rubb'd it often with the Vitriol or Alum-Stone, and dreſs'd the Lips with *Unguent. Tutiæ, &c.* In leſs than Six Weeks Time the Bones exfoliated; and the Wound being ready to cicatrize, I left it to the beforeſaid neighbouring Chirurgeon.

An Obſervation of a large Fiſſure in the Skull, and the Dura Mater *putrefied.*

A Little Girl happening to have a Fall down a Pair of Stairs, which cauſed a ſoft Swelling on the Left Side of her Head, about the Temporal Muſcle, of the Bigneſs and Shape of half a great *French* Walnut, the ſame was neglected, doubtleſs, by the Ignorance of her Friends, who ſuſpected no Fracture, though there were viſible Symptoms of Concuſſion, as that of Vomiting, *&c.* the Child having languiſhed for ſome Weeks before it was brought to me. There being no other Way to relieve the Child than by opening that Tumour, and afterward the Skull underneath, (as I ſuppoſed) and yet the Child being too weak to ſuffer an Inciſion-Wound round the Tumour, I applied a mild Cauſtick, and about Two Hours after took it off again; and finding it had done what it ſhould do, I divided the Eſcar, and diſcharged about Three or Four Spoonfulls of a filthy *Sanies*. I took off the Eſcar the ſooner, leſt it might penetrate through, and offend the Parts within.

Upon dividing the Eſcar, the Bone appeared bare the whole Length, and a long Fiſſure ran tranſverſe over, from the Temporal Muſcle backwards. The Skull was ſo thin, as to yield to the leaſt Preſſure of my Finger, almoſt like a Piece of Vellum; ſo that I might have enlarged it with my Knife, if I had thought it convenient or neceſ-

neceſſary; but I contented my ſelf with bowing the Child's Head on that Side, and drop'd in a little *Mel Roſ.* with a few Drops of *Tinct. Myrrhæ*, *Aloes*, *&c.* and with Pledgits dipp'd in the ſame lightly covered the Bone.

I then dreſs'd up the Eſcar with *Unguent. Baſilic.* malaxed *cum Oleo Liliorum*, and laid a Cephalick Emplaſter over all, with proper Bandage. I kept on the ſame Way of Dreſſing every Day, and obſerved Pieces of the *Dura Mater* purge out, and hang in the fiſſured Edges of the Bone; and for ſome Time a thin *Ichor* iſſued from thence.

The Eſcar being ſeparated, I dreſs'd the Lips with *Mundific. Paracelſi*, and the Bone with *Liniment. Arcei*, and drop'd into the Fiſſure the Balſam preſcrib'd by *Vigo*, by which it incarned, and as the Bone exfoliated, united with the Lips of the Ulcer.

When I began the Cure, there was a Tumour behind the Ear; but by embrocating it every Day with *Ol. Roſ.* it went off, after the Digeſtion of the Ulcer above.

A remarkable Obſervation of a Caries *through the Skull, wherein the* Pericranium *and* Dura Mater *were grown together.*

A Gentlewoman happening to have a Fall with her Child of half a Year old in her Arms, the Child received a ſmall Scratch on the Left Side of its Head, which at that Time was judged inconſiderable; but the Child from that Time was ſubject to frequent Vomiting; and when ſhe grew able to ſpeak, ſhe complained of a Pain in that Part of the Head, and languiſhed daily. After Ten Years a ſmall Tumour appeared in that Part of the Head where it had been hurt, and it was brought to me in a very lean and weak Condition.

I felt a Pulſation in the Tumour, and at firſt took it for an *Aneuriſma*; but preſſing my Finger hard upon it, I felt the Membrane of the Brain without any Skull the Breadth of an old *Engliſh* Shilling. I was not a little amazed at firſt; but upon Second Thoughts concerning the Fall and the ſucceeding Symptoms, it ſeem'd evident to me, that the Skull had been fiſſured; and being of a thin cartilaginous Subſtance at the Time of the Firſt Infancy of the Child, it was mouldred away, and the *Dura Mater* thruſting outwards, had adhered to the *Pericranium*.

Nothing elſe could be preſaged in this difficult Caſe, but either a ſudden Death, or the attempting of a moſt dangerous Cure: For if the circular Inciſion round the Tumour in the Skull was not very difficult, the Separation of the *Dura Mater* from the *Pericranium*, or this from that, muſt needs prove a very hard Task in a weak Child. However, after having forewarn'd the Child's Friends of the Danger on both Sides, and they having left her abſolutely to my Diſpoſal, I ordered the Hair to be ſhaved off from the Tumour, and applied upon it the moſt gentle Cauſtick I could deſign. When I judged it might have made its Way thro' the Surface of the *Calvaria*, I took it off, and with a Cauſtick-Stone rubbed into the muſculous Skin, then waſhed out the Salts well, with Wine firſt, then with Milk.

This done, I embrocated it with warm Oil, and cut into the Eſcar, embrocated the Part again, and dreſs'd it up with *Unguent. Baſilic.* with *Ol. Roſ.* applying *Empl. e Bolo* over all, with Compreſs and Bandage. She had the ſame Night ſome Convulſions, vomited frequently, and was very ill. She was relieved by ſome Intervals by the Preſcription of a Phyſician, and next Morning I took off the Dreſſings, and raiſed up the hairy Scalp round from the Skull, ſo far as the Cauſtick had ſpread, which gave a Breathing to it, and diſcharged a little *Ichor*.

From that Time her Vomiting ceaſed, as well as the Convulſions, and appeared to be better than ſhe had been in Ten Years before.

We ordered her to be kept very cloſe and warm in Bed, with a ſlender Diet of Spoon-Meats only; and whilſt her Phyſician ordered her internal Remedies, I proceeded to haſten Digeſtion, and by Fomentations to cheriſh the native Heat of the Part. Some Places I digeſted, others I deterged; and notwithſtanding all the Difficulties that were to be ſurmounted, it ſucceeded happily; and whilſt ſome Sloughs were ſeparating, other Parts incarned and cicatrized.

To

To be ſhort, the *Dura Mater* was incarned, the Edges of the Bone exfoliated; and the Wound being cicatrized, and contracted to a very narrow Compaſs, the Child return'd to her Friends in perfect Health; is a ſenſible Child; but 'tis believed ſhe will never attain to her full Growth.

An Account of a large Fiſſure by Contuſion, without Wound.

A Perſon of Quality, of about Ten Years of Age, by a Fall from his Horſe, received a Bruiſe on his Head, on the Right Side, a little above the Temporal Muſcle: He was alſo ſtunn'd by the Fall, and vomited.

I was call'd within an Hour after; and finding a large Tumour in that Place, judged the Skull to be fractured; and whilſt the Phyſician was a coming, I opened the Jugular Vein on that Side, took away ſome Ounces of Blood, and prepared Dreſſings.

The Phyſician being come, I laid open the Skull by a circular Inciſion; and diſcovering a Fiſſure, fill'd up the Place with Doſſils of dry Lint, *Pulv. Galen. & Empl. e Bolo*, with Compreſs and Bandage over all. The next Morning the Patient was ſomewhat relieved, and a Clyſter was adminiſtred; and the next Day we took off the Dreſſings, and ſaw a large Fiſſure ſtretching from the *Sutura Coronalis* to the Temporal Muſcle.

The Seroſity being diſcharged thereby, and the Patient relieved by the before-mentioned Symptoms, I was not for the applying of the Trepan; but being over-ruled by the others, I fixed the Trepan on the declining Part, ſomewhat diſtant from the Fiſſure; and after having accompliſhed the Perforation, dreſſed the *Dura Mater* with *Ol. Roſ.* and Reſin, the Skull with dry Lint, and the Lips with a Digeſtive *ex Terebinth, &c.* then embrocated the circumjacent Parts, and applied *Empl. e Bolo*, with Bandage. By the Application of theſe, the *Dura Mater* digeſted, and ſoon after incarned; but the Seroſity being diſcharged by the Fiſſure, the Evacuation through the Aperture made by the Trepan was ſmall, and judged not ſufficient; and I willing to juſtify my Way of Dreſſing, and yet ready to comply with the common Practice, dreſs'd it up with *Mel Roſ. & Spir. Vini*: But the Matter at the next Dreſſing appeared leſs, and the Day after the ruddy Fleſh upon the *Dura Mater* pale and withering. I applied again the *Ol. Roſ.* and Reſin; and at the next Dreſſing found the Fleſh ruddy, and better digeſted; and after a Dreſſing or Two more, the Membrane ſo incarned, that I was glad to keep it within Compaſs by the Application of a Doſſil of dry Lint; and from that Time my Buſineſs was to ſuppreſs it with *Merc. Præcipit.* and good Compreſſion.

During this the Skull was dreſs'd with Pledgits preſs'd out of *Spir. Vini*; and while the Bone was exfoliating, the Lips were deterged and cicatrized, in order to diſpoſe them to incarn with the Fleſh, riſing from the exfoliated Edges of the Bone.

At length the Bone changed Colour, and ſhook. It appearing afterwards looſe, I rais'd it up with the *Spatula*, and took it off, we ſuppoſing it an Exfoliation; but by the Pulſation in the Fleſh under, it appeared to be both Tables of the Skull.

This was in all Probability the Effect of the Contuſion, of which, though there appeared not any Marks, yet doubtleſs by the Violence of the Blow, the natural Heat of the Bone being extinguiſhed, it ſeparated as a dead Bone; a Sort of Contuſion which has been taken Notice of by the Ancients; it being without Danger to the Patient, if there be a ſufficient Diſcharge otherways for the *Matter*, as there was here by this Fiſſure.

The Pulſation decreaſed as the Fleſh became callous and harden'd, which it did not long after into a Bone. About that Time the Fiſſured Bone caſt off its Edges, and that Fiſſure incarned, and ſupplied the Place of the Bone, and the Wound cicatrized by the common Epuloticks.

This Perſon had formerly been ſubject to frequent Pains in his Head and Vomitings from his very Infancy, which made us not to be too forward in cicatrizing it; but after ſufficient Evacuation by Purgatives, *&c.* we cicatrized, and he enjoys a perfect Health ever ſince that Time.

Another Obſervation of a Fiſſure, with a Fracture and Depreſſion of the Skull, under the Temporal Muſcle.

A Young Maſon received by a Fall Three Stories high a Contuſion on his Head, at the Right Temporal Muſcle. He was taken up Speechleſs, but recovered his Senſes upon his being let Blood immediately. The contuſed Part was ſwelled; he vomited often, and had ſhrewd Symptoms of a Fracture.

So I ordered his Hair to be ſhaved off, and made an Inciſion in the higheſt Part of the Tumour, from his Ear forward, above Two Inches in Length, as near the Temporal Muſcle as I durſt; and having at the ſame Time divided the *Pericranium*, I thruſt it off from the Bone; and then with a Sponge preſs'd out of Red Wine, wiped off the Blood, and obſerved a Fiſſure running the whole Length of the Wound. I diſcovered beſides this, another Fiſſure, ſtretching from the former downwards towards the external *Canthus* of that Eye; and the lower I preſs'd with my Finger, the more rough the Bone felt.

I found there was a Neceſſity for cutting the Temporal Muſcle; ſo I drew my Inciſion-Knife downwards, and ſaid open the Wound in the Form of a *Roman* T; but the inferior Lips being muſculous, would not turn back to bare the fractured Bone, as I deſigned, and therefore ſaw my ſelf obliged to reſt ſatisfied with what I had done, and filled up the Wound with Doſſils of Lint, and embrocated the circumjacent Parts with *Ol. Roſ. cum Albumin. Ovi*, and applied *Empl. e Bolo* over it, with Compreſs and Bandage, and then laid him to Reſt with an Anodyne Draught.

But the next Morning the Patient was in a Fever, having reſted very ill all that Night, vomited much, and complained of an exceſſive Pain in that lower Jaw. I took off the Bandage and Emplaſter, and dreſs'd the Lips of the Wound with a Digeſtive *ex Terebinth, &c.* upon Pledgits dipp'd in *Ol. Hyperici*, hot, and embrocated the circumjacent Parts with *Ol. Cham. & Roſ.* and applied a Cataplaſm *ex Far. Hord. Flor. Roſ. rub. Balauſt. &c.* After this he was let Blood in the Jugular on the ſame Side, a Clyſter was ordered, a Ptiſan, and contemperating Juleps.

Being very unwilling to cut more of the Temporal Muſcle, I deſired a Phyſician might be conſulted; which being done accordingly, we found the Patient very reſtleſs, and labouring under an Increaſe of all the before-mentioned Symptoms. The upper Lips of the Wound digeſted, but the lower more dry and tumefied, eſpecially upon the inferior Part of the Temporal Muſcle: Upon the Preſſure whereof a white *Matter* was diſcharged from within, between the Skull and the muſculous Fleſh, where we ſuſpected the Depreſſion of the Bone to be.

There being therefore an abſolute Neceſſity of cutting off Part of the Temporal Muſcle, in Form of a Semicircle, we mark'd it with Ink from the upper Part; and ſo paſſing an Inch or more of the external *Canthus* of the Eye, carrying it towards the Ear, to take off that Lip which was lying over the depreſs'd Part. This being thus mark'd, we cut it off accordingly; and there happening an Effuſion of Blood out of both Ends of the Arteries, we applied Doſſils dipp'd in the Royal Styptick, fill'd up the bared Skull with our Dreſſings, and then bound up the Wound; at the ſame Time muffling up his Jaw with a Chin-Cloth, it being exceſſive weak.

At the next Dreſſing we applied the Trepan, and then with a Levator raiſed up the depreſſed Bone, and drop'd into that Wound a Solution of Reſin in *Mel. Roſ.* and then dreſſed the trepan'd Hole with *Ol. Roſ.* upon a ſoft Doſſil; and the reſt of the Skull we covered with Doſſils preſſed out of *Spir. Vini*, and applied Digeſtives over the Lips of the Wound; and at the Second Dreſſing found the *Dura Mater* under the perforated Bone incarned ſo well, that from that Time we applied only a little round Doſſil to keep the Fleſh from thruſting out of it.

But from the Fracture below abundance of purulent Matter came forth every Day, which being increaſed, as we ſuppoſed, by the Hollowneſs which it had made between the Muſcles and fractured Bone, which, tho'

depending, retained its Cavity in Spite of all our Endeavours by Compreſs and Bandage. We, to prevent the Enlargement of this Hollowneſs, applied a Cauſtick on the Outſide, and the next Day divided it, from which Time the *Matter* diſcharged it ſelf that Way, and the internal Hollowneſs diſpoſed to a Cure.

That Fiſſure which ſtretched it ſelf from his Ear towards the Bone, did lie ſo far undiſcovered, that neither the Beginning nor the End of it was diſcernable to the Eye; but this we did not much regard, ſeeing that Part which was diſcovered was ſufficient to diſcharge the *Serum*. I raſped the *Cranium*, and covered it with Doſſils dip'd in *Spir. Vini, &c.* keeping them cloſe to the Lips of the Wound, and by timely rubbing the beforeſaid Lips, and every Super-Excreſcency, with the Vitriol Stone, and kept the Skull dry, and diſpoſed it towards an Exfoliation; and after the Diſcharge of Matter ceaſed from within the Skull, left the Exfoliation and Incarning of it chiefly to my Servants. The Wound was cicatrized in leſs than Two Months, as in Effect they will all do, provided they be treated as they ought; but if out of Ignorance or Neglect the Skull be ſuffered to be overgrown with looſe Fleſh, a great Diſcharge of Matter will enſue, the Skull will corrupt, and the Cure be protracted.

Concerning Concuſſions and ſimple Contuſions on the Head. Taken from the ſame Authors.

COncuſſions and Contuſions may happen on the Head, though the Skin remaineth whole, and even then produce moſt pernicious Symptoms, very like unto thoſe of Fractures, nay often exceeding them.

There may happen Concuſſions of the Brain from a Blow, Fall, *&c.* nay ſometimes from a Box on the Ear, in which the Symptoms may riſe to a great Height, without breaking either the Skin on the Out, or the Skull on the Inſide. Theſe Concuſſions, if they be of the leſſer Sort, *i. e.* where no Veſſel is broken, or Blood extravaſated, and the Perſon is only ſtunned, the Patient ſoon recovers; but if of the greater Sort, *i. e.* where they are attended with a Diſruption of the Veſſels, and an Extravaſation of Blood, they produce *Stupores, Deliria, Vertigoes*, and other ſuch-like Symptoms, and are as dangerous, nay often more dangerous, than Fractures themſelves.

As for the Contuſions, they are conſiderable, whether they be with a Wound or not. Thoſe without a Wound are generally accompanied with great Concuſſions, and ſometimes with Fiſſure, Fracture, *&c.* Of which in another Place.

As to the Cure of ſimple Contuſions of the Hairy Scalp, happening by Blow or Fall, attended with Pain, Inflammation, and Tumors, you muſt either, in order to prevent or remove them, ſhave off the Hairs, if there be any, and embrocate the Tumor and Circumjacent Parts with *Ol. Roſ. Myrtil.* and Vinegar, and apply the following or ſuch-like Cataplaſm to the affected Parts.

Rs. *Far. Hord. Fabar. ana Unc.* vj. *Pulv. Nuc. Cupreſ. Balauſt. Alum. Roch. Drachm.* j. *Roſ. rubr. Drachm.* vj. *Ol. Roſ. Unc.* iij. *Album Ovor. Num.* ij. *Aceti, q.ſ. fiat Cataplaſma.*

After having thus dreſſed your Patient, adminiſter Phlebotomy in the Arm or Neck of the ſame Side, and ſome Hours after order him a Clyſter, and lay him to Reſt all Night, by the Help of an Anodyne Draught, of the Emulſion of the Cold Seeds, *&c.*

The next Day repeat the ſame Method of Dreſſing; and after thereby you have check'd the Afflux of the Humours, you muſt foment the remaining Swelling with red Wine, wherein have been boiled before, *Fol. Betonic. Flor. Anthos, Stœchad. Cham. Roſ. rub. Bacc. Myrtil. &c.* and embrocate with *Ol. Roſ.* and *Chamæm.* but in caſe you find it grow hard and painful, and tending towards an Apoſtemation, you muſt foment it with *Decoct. Summit. Malvæ, Rad. Altheæ, Sem. Lini, & Fœnugræci*, and make a Cataplaſm of the *Faces*, with the Addition of *Far. Hord. &c.* If it happens to ſuppurate, treat it as a *Phlegmon.*

But if the Pain do mitigate, and yet the Tumor does continue, with extravaſated Blood, like as in an *Ecchymoſis*, you muſt then endeavour to diſcuſs and dry up the Seroſity by the following Remedy, or ſuch like.

Rs

Rs. *Far. Hord. Fabar. ana Unc.* iij. *Flor. Roſ. rubr. Bacc. Myrtil. ana Unc.* j. *Summit. Abſinth. Fol. Betonic. Flor. Sambuci, Chamæm. ana Drachm.* iij. *Semi-Cymini, Drachm.* j. *Pulver. & coq. in Vin. rubr. Addend. Mel. Comm. Unc.* ij. *Ol. Roſ. & Chamæm. ana q.ſ. fiat Cataplaſma.*

If by theſe Remedies the Humour does not dry up, nor the Tumour be diſpelled, you muſt begin with letting of Blood, and reiterate it as often as you ſee Occaſion, even to the Deliquency or Failing of the Spirits: Keep the Body open by Clyſters, and check the Fermentation in the Blood by frequent Draughts of Emulſions, *&c.* The external Applications muſt be very near the ſame as have been mentioned before, to wit, by ſhaving off the Hair, and embrocating the Head and Neck with *Ol. Roſ. Myrtil. Album Ovor.* and Vinegar, and make Application of Cataplaſms as mentioned above, boil'd in red Wine or Oxycrate.

After ſome Time, when the Symptoms are ſomewhat allay'd, apply *Empl. Vigonis* againſt Contuſions; or this following, which is taken alſo from the ſaid Author:

Rs. *Furfur. Tritic. Unc.* iij. *Far. Lentium, Unc.* ij. *Flor. Roſ. rubr. Bacc. Myrtill. Balauſt. ana Drachm.* j. *Calum. Aromatic. Unc.* j. ß. *Flor. Chamæm. Melilot. ana Unc. Sem. Nuc. Cupreſ. N°* vj. *pulver. omnia, & coq. in Vin. Auſter. q.ſ. ad conſiſtentiam Cataplaſm. Addendo Ol. Roſ. Cham. ana Unc.* iij. or with Wax you may make it up into the Form of a Cerote.

You may make alſo Fomentations of the before-mentioned Ingredients; but in caſe the Concuſſion don't ceaſe by the before preſcribed Remedies, then you muſt lay open the ſuſpected Part, and proceed as ſhall be ſhewed anon in ſome Inſtances.

In great Contuſions without a Wound, if there be a large Tumour that feels pappy, and increaſes notwithſtanding your Application of Refrigerants, you may rationally conclude the Quantity of the *Serum* that raiſes the Swelling to proceed from within thro' ſome Fiſſure in the Skull, and then you muſt make Inciſion proportionably; and if you feel no Part of the Skull depreſſed, dreſs it up with Digeſtives, and apply ſuch Medicaments over it as are generally preſcribed in Contuſions; and if thereupon the Tumor do flat, and the Wound is brought to a Digeſtion, proceed in the Cure accordingly: But if there be Depreſſion, or other ill Symptoms of internal Hurt, you muſt lay the Hairy Scalp more open, and thereby make Way for further Inſpection and Operation.

In the Cure of Wounds of the Head, if they be made by a Rapier, dividing the Scalp to the Skull, nay even tho' it penetrate into the Skull, if there be no Symptom of an internal Hurt, the Lips of the Wound muſt be nevertheleſs brought cloſe together, and healed by Agglutination. Some object againſt the Stitching of theſe Wounds, becauſe, ſay they, the Matter is detained inwards, and corrupts the Bone; but in caſe you are convinced that the Wound ought ſpeedily to be healed, it may be done with Safety, provided it be done with Judgment and Diſcretion. I have ſeen them ſtitched in *Spain* as commonly as other inciſed Wounds, and ſo we do in the Wars with good Succeſs: And I have in *London* ſtitched up great Wounds of the hairy Scalp; but great Care muſt be taken not to crowd theſe Wounds with Doſſils; for by ſo doing you may raiſe a Fever, and prolong the Cure. Wherefore after you have clip'd away the Hair, dreſs the Wound with *Pulv. Galen. & Empl. e Bolo*, or ſome Defenſative, with Compreſs and Bandage, ſo as to bring the Lips cloſe together; and if the Patient did not bleed much at the Wound, let the Patient Blood, and order a Clyſter for the next Day, if the Body be not ſoluble.

At the next Dreſſing embrocate the adjacent Parts with *Ol. Roſ. &c.* and dreſs the Wound with *Liniment Arcei* upon Pledgits. But if the Lips of the Wound were not brought cloſe together at the firſt Dreſſing, it will be requiſite to dreſs it with Digeſtives, *ex Terebinth. &c.* embrocating the circumjacent Parts, and apply Plaiſters accordingly. By this Method all the inciſed Wounds may be cured in a few Days.

In Wounds of the Head, inflicted by a Weapon with an obtuſe Edge, or where there is Loſs of Subſtance, there you muſt digeſt, and to that Purpoſe the common Digeſtive, made of Turpentine, Whites of Eggs, and *Farin. Hordei*, is the moſt proper; and if you add to it either *Mel. commun.* or *Rs. ſat. Pulv. iros, Sarcocoll. &c.* it may ſerve

afterwards for a good Deterſive; and with a farther Addition of Myrrh and Aloes it will make a good Sarcotick. Or elſe you may incarn with *Liniment. Arcei*, which was by him peculiarly adapted to the Wounds of the Head. *Vigo* commends the following:

Rs. *Ol. Roſar. Unc.* vj. *Ol. Maſtich. Unc.* ij. *Pinguedin. vitulin. Porcin. ana Unc.* iv. *Fol. Plantag. Matris Sylvæ, Beton. Pimpinellæ, Piloſellæ, Flor. Anthos, ana M. ß. Vini Odoriſici cochl.* vj. *coq. ad Conſumptionem Vini colaturæ. Adde Maſtich, Gumm. Elemi, Reſinæ, Pin. ana Unc.* j. *Lithargyr. Auri & Argenti, ana Unc.* ij. *Mimii, Drachm.* x. *Terebinth. Venet. Unc* iv. *Ceræ q. ſ.*

If ſome luxurious Fleſh ariſes during the incarning of the Wound, you muſt touch it with a Vitriol-Stone, and it will deterge, and diſpoſe it to cicatrize, which you may then compleat with Pledgits of Lint preſs'd out of *Spir. Vini, Aq. Calcis, &c.*

An Account of a Contuſion without a Wound or Concuſſion.

A Young Fellow, who had been ſeverely beaten about the Head with a Cudgel, was quite dozed with the Pain. I being ſent for, ſaw the Head ſweell'd in ſeveral Places; ſome of the Tumours being large and pappy, and abounding with extravaſated *Serum*. Perceiving the Jugular Veins turgid, I open'd one of them, and took away about Twelve Ounces of Blood, cauſed the Hair to be ſhav'd off, and then embrocated all his Head, Neck, and Jaws, with a Mixture of *Ol. Roſ. Myrtil. acet. cum Album Ovi*, and applied over all his Head a Cataplaſm of *Far. Hord. Fabar. Flor. Roſ. rubr. Balauſt. Bacc. Myrtill.* boil'd in Oxymel.

I ordered a Clyſter to be adminiſtred the ſame Evening, and an Anodyne Draught. He reſted pretty well at Times that Night; yet he was hot the next Morning, and his Pulſe quick: So I opened the other Jugular Vein; and finding the Blood to come in a full Stream, I did bleed him plentifully: Then having a Fomentation ready of Claret Wine, wherein had been infuſed *Flor. Roſ. rubr. Balauſt. Nuc. Cupreſſ. &c.* I took off the Dreſſings and ſtuped them, and intended to have opened one of theſe Tumours; but finding it to leſſen, I did not, and only embrocated his Head again with *Ol. Roſ. Myrtil. & Aceti*, and applied the before-preſcribed Cataplaſm.

By theſe Remedies I dried up the greateſt Part of the Humour before the Seventh Day; then added ſome Cephalicks to the former Ingredients, and boiled them in Wine and Water, and with it cauſed his Head to be fomented, and afterwards applied *Vigo*'s *Cerat. ad Contuſiones.*

During the Firſt Seven Days I allowed him only Watergruel or Panada, and kept his Body open by Clyſters; but after that Time gave him a greater Liberty of Diet, and gave him ſome Purgatives, and ſo he recovered without any further Trouble of laying open.

All external Contuſions may be cured with Succeſs by the ſame Method, if taken in Time.

A Perſon of Honour of about 40 Years of Age bruiſed her Head a little above the Temporal Muſcle, by a Fall out of her Coach. She was ſtunn'd by the Fall, but did not vomit; and was dreſs'd by ſome of her Servants with ſuch Applications as they were adviſed to for the preſent. But about Fourteen Days after, finding her ſelf much indiſpoſed, I was ſent for, and found a large *Echymoſis* remaining, and a Tumour of the Bigneſs of a Pheaſant's Egg, which was ſoft, and ſeem'd to be full of corrupt *Serum.*

There being no Hopes of diſcuſſing it, and not ſafe to let it remain longer ſo near the Bone, I applied a mild *Cauſtick* upon it; and dividing the Eſcar, gave Vent to the *Serum*, and ſome Clots of grumous Blood; then fomented it with Wine, and dreſs'd it up with a Doſſil ſpread with a Digeſtive *ex Terebinth.* and *Unguent. Baſilic.* over it upon the Eſcar, and embrocating the circumjacent Parts with *Ol. Chamæm.* applied *Empl. Diapalm.* with Compreſs and Bandage.

At the next Dreſſing I found the Ulcer well digeſted, but no Part of the Bone bare: Nor was it painful either during the Time of Dreſſing, or afterwards; notwithſtanding which, from the Firſt Day of Dreſſing her, ſhe moſt commonly fainted; but

but after ſhe had lain an Hour or Two upon the Bed very ſick, would recover again, and walk about the Room very well.

A Phyſician being called upon that Account, I ſhewed him the Ulcer diſpoſed to heal, and the Phyſician likewiſe judged it to be ſo: But before I had finiſhed my Dreſſing, ſhe was ſeized by one of theſe fainting Fits, which increaſing, were at firſt attributed by the Phyſician to the Contuſion; but ſeeing her recover ſo well afterwards, he agreed with me, that they proceeded from Vapours; ſo ſhe was gently purg'd once in Three or Four Days; by which Means being ſomewhat eaſed of her Fits, I cicatrized the Ulcer, but ordered an Iſſue to be made in her Leg. She went to her Country-Houſe, where, by the Help of ſome Phyſick ſhe took, recovered perfectly well.

Had theſe Fits proceeded from the Contuſion, they would not have intermitted ſo well as theſe did.

An Account of a contuſed Wound.

A Certain Perſon of about 36 Years of Age being wounded by a Blow upon the *Os Frontis*, near the *Sutura Sagittalis*, about the Length of Two Inches, I was ſent for. Having cleanſed the Wound with a Sponge, and clip'd the Hair away, I put my Finger into the Wound, and felt the *Pericranium* ſound and ſmooth, nor obſerv'd any Signs or Symptoms of Fracture or Concuſſion.

I brought the Lips of the Wound cloſe together, dreſs'd them with a Digeſtive *ex Terebinth.* upon Pledgits, with an *Empl. e Bolo* and Compreſs over it. I did not adminiſter Phlebotomy that Night, becauſe I underſtood he had bled much before thro' the Wound; and finding him in good Temper the next Morning, I neither let him Blood, nor dreſs'd him.

But the next Day, when I took off the Dreſſing, the Wound ſeeming very near cloſed, I applied a Stupe or Two wrung out of Red Wine, and then dreſs'd him with *Liniment. Arcei.* The Second Day after I open'd it again, and obſerving the bruiſed Fleſh between the Lips of the Wound cicatrizing, I dreſs'd them with *Unguent. Tutiæ*, which I continued to do every other Day, and ſo was cured in a few Days: Whereas if the Wound had been fill'd with Doſſils, a Fever and other ill Symptoms would have enſued, which muſt of Neceſſity have protracted the Cure.

An Obſervation of the hairy Scalp being torn off.

A Young Fellow being thrown off his Horſe againſt the *Bars* in *Smithfield*, the hairy Scalp was torn up from the *Sutura Coronalis* to the Temporal Muſcle on the Left Side, and the Skull bared between Two and Three Fingers in Breadth. A Barber hardby cut off the Piece; but the next Day the Patient being brought to me, I cauſed the Hair to be ſhaved off from about the Wound, and dreſs'd the Bone and Lips with *Liniment. Arcei* warm, embrocated the adjacent Parts with *Ol. Roſ. & Chamæmil*, and applied *Empl. e Bolo* over the Wound, with Compreſs and Bandage, rolling up his Head.

He having been let Blood the Day before, I continued the former Way of dreſſing the Wound and Bone until they were well digeſted, during which the Edges of the Bone incarning, I raſped the Middle of the Bone, and thereby promoted the coming forth of the *Callus*.

After Digeſtion I deterged with *Mundific. Paracelſi*; and as the *Callus* was put forth, I dreſs'd it with Pledgits dipp'd in *Spir. Vini*, preſs'd out dry, and afterwards by Epuloticks, as *Unguent. Tutiæ, &c.* cicatrized the Lips of the Wound even with the *Callus* which roſe from the Bone, and about the ſame Time gave him a Purge to promote Cicatrizing.

In this Manner it was cured like a Wound, with Loſs of Subſtance, which might at firſt have been cured with much leſs Trouble, both to the Patient and Chirurgeon, by Agglutination with leſs *Cicatrix*, and ſo he might have kept the natural Tegument with its Hair, whereas now that Part remaineth bald.

An Account of ſeveral Concuſſions on the Forehead and Face, with a Wound.

A Certain Perſon was, by a Fall from his Horſe upon the Ground, bruiſed and wounded on the Forehead and Face, ſo that he was taken up for dead, but recovered Life again ſoon after. When I came to him, I found him labouring under a great Concuſſion, his Face and Noſe being much bruiſed, and there was a Wound likewiſe upon the *Os Cribriforme*.

After I had cauſed the Blood and Gravel to be well waſh'd out of the Wound, I laid it open with my Knife a little higher up towards the Forehead: and upon viewing the Bone, finding it without a Fiſſure, I brought the Lips cloſe together, and dreſſed the Wound with Agglutinatives, and an *Empl. e Bolo* over it and his Face.

I alſo cauſed the Hair to be ſhaved off of the fore Part of his Head, from the *Sutura Coronalis* down to his Ears, and embrocated the affected Parts with *Ol. Roſ. cum Aceto.* I alſo applied a Cataplaſm of *Farin. Hord. Flor. Roſ. rubr. Belauſt. Bacc. Myrtill.* boil'd in Oxymel, and then took away Ten or Twelve Ounces of Blood.

A Phyſician was call'd, who preſcribed what he judged convenient internally in his preſent Condition; but the Patient continued dozing all that Night, groaned frequently and heavily, and continued ſo in the Morning: He ſpoke very little, and what he ſpoke was not intelligible.

I took off his Dreſſings, took an exact View of and felt the Parts round about. The Left Eye was much inflamed, and the Lid ſwelled, and the Forehead bruiſed; and being not able to diſcover any Thing that could furniſh me with freſh Indications, I dreſs'd him up again as before, renewing the Embrocation and Cataplaſm; and ordered a little Breaſt-Milk to be drop'd warm into his Eye. The ſame Day he was let Blood again, and a Clyſter adminiſtred, with what elſe was thought requiſite by his Phyſician.

The next Day he continued as ill as before; ſo another Chirurgeon was conſulted, and we both viewed the Wound, and finding the Bone fair, without the leaſt Impreſſion, we concluded that the Wound might be cured without any further Enquiry into it; which was accordingly done in a few Days, without any Exfoliation. Nothing was omitted in bliſtering of his Neck and Shoulders, Cupping with Scarification, Iſſues behind his Ears, Fomentations; and Plaiſters were likewiſe applied to his Head, but without any conſiderable Relief to the Patient.

However, by frequent Purging, and ſome other Remedies, he recovered ſo far, after a Month or Six Weeks Time, as to be able to go abroad; but ſtill continued much indiſpoſed in his Head. His Eye was well alſo; but after he had followed his Buſineſs for ſome Weeks, that Eye-Lid on a ſudden fell down; and within ſome Months after, he quite loſt the Sight of that Eye, without any outward Soreneſs; this being doubtleſs the Effect of the Concuſſion. If any Thing was omitted, it was further Bleeding.

Some Additional Obſervations of the Wounds of the Brain. Taken from the ſame Author.

THE moſt pernicious Symptoms that are ſaid moſt commonly to attend the Wounds of the Brain, do make their Appearance with much more Uncertainty than can well be imagined; and in Cuts and Wounds made by ſharp Weapons or ſudden ſtrong Force, with much more Uncertainty than in Contuſions, Concuſſions, and Depreſſions of the Skull, *viz.* Vomiting, Stupour, Loſs of Appetite, *Paralyſis* in Legs and Arms, ariſing more ſuddenly in theſe latter Caſes than in the former.

Theſe Symptoms have appeared ſometimes, though there was nothing of Fiſſure or extravaſated Blood diſcovered upon the *Dura Mater* after the Terebration of the Skull; and we have ſeen many die ſuddenly from a Box on the Ear, and from ſmall Blows or Wounds, in ſome of which, upon opening of the Skull, there hath been much Blood extravaſated; in others, none at all, or any Thing elſe has been obſerved that could be judged

judged to have been the Cauſe of the Patient's Death.

I ſaw a young Man, who having receiv'd a Blow with a Cudgel upon the Forehead, preſently after became delirous, which being followed by a ſoporous Affection, he died within a few Days after. I ſaw his Head opened, and in his Forehead obſerved a ſmall Fiſſure like a ſmall Hair, ſtretching from the great *Canthus* of the Eye upward. We took off the Skull and *Dura Mater*, and found but little Blood extravaſated, and the *Pia Mater* as little altered.

I have been preſent at the opening of others, where there had proceeded only a Contuſion of the hairy Scalp, without any Fiſſure, or more extravaſated Blood, than is uſually obſerved in every Opening of the Skull; yet the Patient (as I was told) did labour under all thoſe Symptoms of *Delirium, Coma, &c.* On the other Hand, I have had the Dreſſing of many that were cut through the Skull, with the Shivers of Bones lying puſh'd with the Fleſh and Hair upon the *Dura Mater*, and yet there were no ſuch Symptoms, which I ſuppoſe might happen partly by Reaſon of the Bones lying looſe upon the Membranes.

At *Sterling* a Servant Maid had received a Wound on her Head by a Musket-Bullet; there being a Fracture, with a Depreſſion of the Skull, I applied the Trepan for the raiſing up of the depreſs'd Bone, and for the Diſcharge of the *Sanies*. She had had this Fracture for above a Week, and yet was not affected with any of thoſe before-mentioned Symptoms; and after Terebration, and the Elevation of the depreſs'd Bone, and dreſſing her Wound, ſhe went her Way, and came every Day to be dreſs'd, as if it had been only a ſimple Wound of the hairy Scalp; though, to the beſt of my Judgment, the Brain it ſelf was wounded.

At the Beating up of ſome of our Outguards near *Truro* by the Enemy, a Trooper was in the Purſuit wounded between the Right Ear and Brow; and ſeeing me among the Crowd, importuned me to dreſs him. I haſtily lifted up the bloody Hair, and ſaw a Quantity of the Brain lie among it, ſome of which I took up with my Fingers, and ſhew'd him; by the Sight whereof his Paſſion being calmed, I had Liberty to flie from the Enemy, who was already enter'd at one End of the Town. Here was nothing to be expected but Death; and yet there appeared none of thoſe pernicious Symptoms which accompany Concuſſions or leſſer Fiſſures.

Nothing is more common than to meet with ſuch Wounds in Battles and Sieges. In theſe, the Firſt Thing to be done, is to open your Way to the Extraction of extraneous Bodies, by cutting off the ſhattered hairy Skin, and then pulling out whatever was carried within the Skull. This done, we dreſs up the Brain and Membranes with a Sindon of Silk, or very ſoft Linen, of a Bigneſs proportionable to the Wound in the Skull, dipping it in a warm Digeſtive, ſuch as is proper and adapted to the Membranes of the Brain.

I know ſome Chirurgeons are of Opinion, That the Brain muſt be dreſs'd with one Sort of Remedies, and the Membranes with another; but I do not ſee how this is to be effected, without manifeſt Danger; for if the Membranes or *Meninges* ſhould be waſh'd with the ſame Medicament, and be impaired with the Acrimony thereof, it would cauſe Inflammation, Fever, *Delirium, &c.*

'Tis therefore that in the Cure of theſe Wounds of the Brain, I have no other Regard to the Body of the Brain, than to an inſenſible Body, the Dreſſing of which conſiſts in keeping it within its Membranes, and treating it as a Wound of the Membranes, with Lenients, *&c.* This may be effected ſometimes in ſmall Wounds of the Brain, if the Fracture of the Skull proves not too large, and then the Patient may recover.

But in caſe the Fracture in the Skull be large, and the Wound in the Brain in Proportion, then 'tis next to an Impoſſibility to retain the Brain within it, and then it will ſoon contract a Corruption by the external cold Air, and will offend the Membranes by its putrid Acrimony, and ſo proves the Cauſe of thoſe ill Symptoms that attend theſe Wounds. The Patient will live ſometimes, till that Lobe where the Wound was given is either quite conſumed, or hath wrought it ſelf forth.

At the Siege of *Melcomb-Regis*, a Foot-Soldier had a great Part of his Forehead carried

ried off, and the Skull fractured in many Pieces, and some of it driven with the hairy Scalp into the Brain, by the grazing of a Cannon-Ball. I pull'd out the Pieces of Bones and lacerated Flesh from amongst the Brain, and dress'd him up with soft folded Linen, dipp'd in a Cephalick Balsam, and with Emplaster and Bandage bound him up, believing this would be the first and the last Time of Dressing him.

Notwithstanding this, he lived for Seventeen Days after; and on the Fifteenth Day walked from that great Corner-Fort over-against *Portland*, to the Bridge which divides *Weymouth* from *Melcomb-Regis*, led only by the Hand of one of his Fellow-Soldiers: But within Two Days after he was seized with a *Spasmus*, and died howling like a Dog, as it most frequently happens to those that have been thus wounded in the Brain.

Much about the same Time a Maid-Servant was shot also with a Musket-Bullet into the Right Side of her Head, deep into the Brain, and she lived so long, until the Lobe of the Brain on that Side was wrought out or corrupted.

I could give you many more Instances of such as have been wounded in the Brain; but these I judge are sufficient to convince the Reader of what I pretend to demonstrate here; to wit, *That the Brain is of it self insensible*; and consequently, that those Symptoms which are the Attendants of these Wounds, are owing to the violent Pain which the Membranes, *viz.* the *Dura* and *Pia Mater*, suffer; for these, if oppressed by the Extravasation of the Blood, or a Depression of the Skull, are soon afflicted with most violent Symptoms, as Vomiting, *Stupor*, *Paralysis*, *&c.* but much more in case they happen to be prick'd by any Spel of a Bone, or by some other extraneous Body that is sharp or pointed at the Ends.

When the Brain it self ouzeth out between the Membranes and the fractured Bones, in the Manner as has been mentioned before, it is of a mild Substance, and serves rather instead of a Lenitive to them; whence it is, that those ill Symptoms do not make their Appearance till the Brain begins to corrupt betwixt them, and with it the Membranes enter into a Putrefaction; and then it is, that the Convulsions, Howlings, *&c.* soon appear, and the Patient is dispatched.

From this Observation it is evident in what preposterous a Way those Chirurgeons do proceed, who dress these Wounds with strong Desiccatives, which, as far as ever I could observe, did always hurt the Membranes, but never contributed the least Thing either towards the Digesting or Incarning the Wound in the Brain: For, as *Hippocrates* expresses it, *Non coalescet*; but as it gets Liberty, it will work it self forth not unlike unto Barm.

'Tis very observable, That those that have the Misfortune of receiving a Wound in the Brain at Sea, die soon after, because there is no Conveniency of lodging them or dressing them so warm as they require.

As to those Wounds of the Brain where there is any Hopes of a Cure, I am free to own, That in the Wars my Employment would not permit me to see the Finishing of these Cures: And here, in my Practice in and about *London*, I never was concerned with any so wounded, where there were any Hopes of a Cure; so that I must leave that Point to others to treat of more at large.

But by what I have seen and observed of them heretofore, their Cure does actually consist (as I have said just now) in dressing these Wounds of the Brain as the Wounds of the *Dura Mater*, and in the keeping of the Brain within its Membranes; without which, 'tis in vain to hope for an Incarnation on the Membranes.

Here follows a remarkable Instance of the Cure of a Spina Ventosa, *or the* Exostosis. *From the same Author.*

THE Patient, about whom I was consulted by a *Latin* Letter, was brought to me about half a Year after, having then a very large *Spina Ventosa*, or *Exostosis*, upon the Outside of the Right Jaw, which threaten'd a total Corruption.

His Friends ask'd my Advice and Judgment, and I told them, That in case the Bone were thin, it might be cut off, by passing an Incision-Knife within his Mouth, between

between this Cheek and the Jaw: But if upon Trial it proved too hard to extirpate, the Wound would ſoon cure without Deformity.

This being delivered not without ſome Heſitation, which ſufficiently ſheweth the little Inclination I had to undertake this Operation, it was not till Three or Four Months after, that the Patient and his Friends reſolved upon the cutting out that *Exoſtoſis*.

At my Requeſt to conſult Phyſicians and Chirurgeons in the Undertaking, Dr. *Charlton*, Dr. *Walter Needham*, and Mr. *Hollyer*, were call'd in upon a Conſultation, wherein it was unanimouſly agreed, That the *Exoſtoſis* might be cut ſafely off; but we differing in the Way how to take it out, it was reſolved to defer the Operation till the *Caries* in the Jaw ſhould make an Eruption, or its Way through.

But the Patient being much unſatisfied with ſuch a dilatory Reſolution, another Conſultation was held on the Third Day after, and reſolved to make an Inciſion between the Cheek and the Jaw to the *Exoſtoſis*, and that, according as the Bone ſhould be found by the Knife to be either hard or ſoft, the Operation ſhould be performed in the Sawing it off, or permitting the Wound to heal.

The Patient being well ſatisfied with this Reſolution, and having agreed to my Requeſt, to wit, That the ſame Perſons that had been conſulted would be preſent at the Operation, his Body was prepared by a purging Apozem Four or Five Days; but we would not adminiſter Venæſection, becauſe ſome Blood would be evacuated during the Operation.

The Patient being ſeated in a clear Light, I paſſed my Knife between the Outſide of his Jaw and his Cheek, cloſe to the *Baſis* of the *Exoſtoſis*, the Length of it, and at that Inſtant attempted the cutting of it, but it was too hard: I told them ſo, and asked, Whether I ſhould pull out the Knife? And it being agreed on all Hands, that I ſhould proceed with the Saw, of which there were Two provided of an equal Size with the Knife, I pull'd out the Knife; and paſſing in the Saw to the very *Baſis*, made a Track; and then deſired the Phyſicians, they would ſeverally lend me a Hand in the Sawing off the Bone, I being too much indiſpoſed for ſuch a Buſineſs alone. Accordingly they did ſeverally take their Turns in this Operation of Sawing off the Bone, which had been accompliſhed at that Time, had it not been for the Weakneſs of the Patient, and the Bleeding of a ſmall Capillary Artery in the Cheek.

So I dreſs'd up the Wound with Doſſils of Lint, to keep it dilated, and thereby ſtop'd the Bleeding. The external Parts were embrocated with *Ol. Roſ. cum Aceto*, and *Empl. e Bolo* was applied over it. The Third Night the Wound fell a Bleeding afreſh, but was ſtopp'd again with a Compreſs dipp'd in the Royal Stiptick, held cloſe to it by Mr. *James Wiſeman*, who was relieved by others; but the Patient not permitting them to hold the Compreſs ſo cloſe as it was directed it ſhould, the Veſſel was the longer in agglutinating, and raiſed an *Ancariſma* of the Bigneſs of a Lupin, which lying in our Way, we burnt it down by a ſmall Button Cautery.

We then all met again, and proceeded in the Sawing off the Bone; ſo that we did all of us ſuppoſe we had finiſhed the Work, (occaſioned by the *Caries* within it, which gave Entrance to our Probes, and made the whole Bone ſeem looſe) and propoſed even to extract it; but the Patient again complaining of his Wearineſs, we went no farther for that Time, but dreſſed up the Wound with a Tent dipp'd in *Vitell. Ovi*; and fomenting the external Parts, dreſs'd them with Liniments, by which the Parts were eaſed, and the Wound diſcharged a well digeſted white Matter.

Some Days after I urged the Extraction of the Bone; but the Patient being for delaying it from Day to Day, there appeared ſome Symptoms of Convulſions; and another Conſultation was appointed, and that Dr. *Lower* ſhould be one of the Number that were to aſſiſt in it: And there being a very ſtrong Suſpicion that the ſaid Convulſions were occaſioned by ſome Shivers of the Bones pricking the Membranes, it was reſolved to haſten the Extraction of them; but his Teeth being ſet, there was no Poſſibility of doing it that Way; and therefore reſolved to apply a Cauſtick on the lower

Part of the Jaw externally, and by cutting through it, to draw out the Bone.

I being ſtill very weak, Dr. *Lower* mark'd it, and together they applied the Cauſtick, reſolving to meet again that Afternoon, in order to divide the Eſcar, and take out the Bone.

However, the Patient being full of Impatience, ſent for us to take off the Cauſtick; ſo I went, and finding an Eſcar made as was deſigned, I would have ſeparated it, but was ſo weak, as not to be able to make uſe of a Knife. Dr. *Charlton* and Mr. *Hollier* happened to be at a Diſſection in Chirurgeons Theater, where Dr. *Walter Needham* was Reader; ſo that only Dr. *Lower* and Mr. *James Wiſeman* could be found.

They being come, Mr. *James Wiſeman* divided the Eſcar, and made the Separation of the Bone, and drew it out. I put in my Finger my ſelf, to feel whether there were any Shivers; but finding none, directed the Dreſſing of it up with *Unguent. Baſilicon* hot.

The ſame Evening all the Phyſicians and Chirurgeons met, and approved of what had been done; and we were in Hopes now, that the Cauſe being removed, the Effects thereof would conſequently ſoon ceaſe. Dr. *Goodard*'s Drops were preſcribed; but they could not agree about the Adminiſtration of Venæſection, and ſo it was deferred.

But the next Morning Dr. *Coxe* being call'd into the Conſultation, he adviſed the Patient to be let Blood, the Hair of his Head to be ſhaved, and Veſicatories to be applied, and various Sorts of internal Remedies were preſcribed. The Wound was open'd and dreſs'd, and appeared not without good Hopes of Digeſtion; yet the Patient died convulſive the Third Day after.

The Patient's Cheek being laid open in the Preſence of all the Phyſicians and Chirurgeons, the Bone was found ſawed off, without the leaſt impairing of the Jaw; but it was very ſpongious, and very deep eaten into by the *Caries*.

The Cauſe of the Convulſions was in all Probability to be attributed to the ill Conſtitution of the Patient's Body, and the exceſſive Acrimony of the Blood, which upon Fluxion fermented, and produced theſe fatal Effects. Thus we ſee that the drying up of a ſlight Excoriation in Infants behind the Ears, has ſometimes cauſed Convulſions; and the like Symptoms frequently appear in the *King's-Evil*, upon the Healing of ſome one Ulcer.

For as to this Operation, it had not much of Danger in it, conſidering the great Fractures in the Jaws which are frequently cured. And it is not many Years ſince I cut into the Inſide of a Man's Cheek, ſawed in Pieces the *Alveolus*, took out the whole Jaw, and cured him: And that this Operation was abſolutely neceſſary, was apparent from the Rottenneſs in the Jaw, upon Diſſection, to any Body, who knows what a *Spina Ventoſa* is, and duly weighs what Progreſs this had made in ſo ſhort a Time.

Another Obſervation concerning ſtrumous Ulcers, with Caries. *From the ſame Author.*

A Certain Perſon of about 13 Years of Age had a *Struma* on the Right Side of his Neck, moveable, and of a round Figure; beſides which, he had a ſtrumous Ulcer in each Arm, the one on the Inſide near the Elbow-Joint, and the other on the Outſide of the *Biceps*. His Hand was likewiſe ulcerated near the Bone, leaning on the Firſt Joint of the Thumb, and carried its *Matter* cloſe by the Bone to the Inſide, ſo as to cauſe a Corruption in the Bone. One of his Ankles likewiſe was ſwell'd and ulcerated in ſeveral Places; and theſe Ulcers being ſearch'd by a Probe, were found to have Communication with one another, through which an Abſceſs lying in the Joint, with Corruption of the Bone, diſcharged it ſelf. He had alſo in the Groin of the ſame Side a Cluſter of *Struma*.

His Phyſicians preſcribed him medicated Broths and traumatick Decoctions; and I began my Work with the laying open of thoſe Ulcers in his Hand and Ankle by a Cauſtick, and by Deterſives conſumed the *Hyperſarcoſis*, and made Way to the Bones, and then dreſs'd them with Doſſils preſs'd out of *Spir. Vin.* and kept the Ulcers dilated. In the mean while I did all I could to digeſt the adjacent ulcerated Parts, and

cicatrize them to the carious Bones, and endeavoured to cheriſh the innate Heat in the Members, and defend them from Fluxion by proper diſcutient and corroborative Fomentations and Bandage; which produced this good Effect, that the Matter leſſening daily, the Patient recovered ſome of his Strength.

I endeavoured the Exfoliation of theſe Bones, ſome Days by Dreſſing them with *Unguentum Egyptiacum*, diſſolved in *Spir. Vini*, *Pulv. Myrrhæ*, *Euphorb. &c.* upon Doſſils hot, which ſucceeded very well to that *Caries* on the Hand; but the Corruption in the Ankle-Joint proved more ſtubborn; and not yielding to this Application, I healed up that Ulcer to the *Caries*, and then applied an actual Cautery through a *Cannula*. I no ſooner preſs'd upon the *Caries*, but the *Matter* ſpurted out, and I pull'd out the Cautery and *Cannula*, and dried the Ulcer with armed Probes, repeating the Uſe of the Cautery till the *Caries* was quite conſumed, and then I dreſs'd it up with Lenitives to allay the Heat.

Some few Days after I dreſs'd the Bone with Doſſils preſs'd out of *Spir. Vini*, and the Lips of rhe Ulcer with *Unguent. alb. Camphor.* and attended the Exfoliation.

During that Time I laid open thoſe Ulcers in his Arms by Cauſticks, eradicated the *Struma* with *Merc. Præcipitat.* and cicatrized them. I alſo cut out the *Struma* under his Jaw, and ſoon cicatrized it: But the moſt troubleſome and the moſt painful of all proved the Ulcer on the Bone leading to the Thumb, becauſe the Tendon did lie over the *Caries*. This obliged me to lay open the Ulcer on the Inſide, in order to apply my Remedies that Way, by which I exfoliated the Bone more eaſily, and cured the former Opening the while, and this ſoon after.

The *Caries* in the Ankle was very ſlow in its Exfoliation; to further which, I was obliged to touch it with *Ol. Vitrioli*. It exfoliated ſoon after, and the Ulcer was cured.

The Swelling in the Groin was embrocated with *Valentia Digitatis* during the Cure, but could not be reſolved till ſome Time after; though the Cure of this Perſon took up no leſs than a whole Year, and remained ſo dubious for a conſiderable Time, that we did not know which was likely to be taken off by Amputation firſt, the Hand or the Foot: But ſince that Time he enjoys the Uſe of both, and continues in perfect Health to this Day.

Another Obſervation of an Abſceſs in the Foot, with rotten Bones. Taken from the ſame Author.

A Gentlewoman of about Sixteen Years of Age, of a ſeeming healthy Habit of Body, being ſeized with a Pain in her right Foot, ſeveral Remedies were applied, and a Bone-ſetter employed; but the Pain encreaſing, with a Tumour, a Chirurgeon finding ſomething reſembling to a Suppuration, opened it, which ſerved only to encreaſe the Swelling.

After ſhe had been in a languiſhing Condition near a Year and a half, I was ſent for, and found her Foot lapp'd up in a Cataplaſm, very much ſwell'd and apoſtemated, diſcharging its Matter every Way, at the Outſide, Inſide, Sole of the Foot, and Heel; ſo that I could paſs a Probe through any Way.

The external Ulcer on the Foot was large, and overgrown with an *Hyperſarcoſis*, and the Bones within the ſaid Foot were moſt of them carious in one Part or other: Nay, ſome of them were rotted to Pieces; ſo that there were ſufficient Indications for Amputation, but could not be put in Execution, becauſe the Patient was weak and emaciated, frequently afflicted with a *Diarrhœa* and Cough, and a great Weakneſs and Dejection of Appetite.

Being withheld by theſe Conſiderations, we were obliged to content our ſelves with a ſuperficial Dreſſing with Pledgits of *Unguent. Apoſtolor.* and told the Patient, that the Exfoliation of the Bones muſt be the Work of Time; though at the ſame Time it being manifeſt to us, that Nature would never be able to encompaſs the Work in this Caſe without the Aſſiſtance of a Chirurgeon, in dreſſing up the *Hyperſarcoſis*, opening a Way to pull out the carious Bones, and dreſſing of thoſe that were as yet leſs carious with proper Exſiccatives. I declined to be concerned in the Cure, unleſs I were permitted to manage it ſo; not that at the

ſame Time I could give them any great Hopes of a ſucceſsful Cure; but there was a Neceſſity of attempting it, ſince without it ſhe muſt infallibly dye of this Diſeaſe.

So immediately I dreſſed up the Ulcer on the upper Part of the Foot, which was covered with luxurious Fleſh, with *Merc. præcipit.* the other with *Unguent. Diapompholi, &c.* and endeavoured the preſſing out of the *Matter*, and the reſtoring of the Foot to ſome Shape by the Help of proper Compreſſes and Bandage. I repeated this Method every other Day, with Compreſſes of Tow, preſſed out of Vinegar, wherein had been diſſolved *Sal. Nitri, Myrrha, Camphora, &c.* But the fungous Fleſh ſtill increaſing, I was obliged to conſume it at once down to the Bone, by the Means of an actual Cautery, and then dreſs it up with Lenients.

From that Time the Matter leſſened every Day, and became well digeſted. After the Separation of thoſe Sloughs, we attempted the remaining luxurious Fleſh in ſome Parts with the Cauſtick Stone, and in others with *Ol. Vitrioli.* Doſſils of Lint were applied, dip'd in *Spir. Vini*, on the Bones, and the luxurious Fleſh ſprinkled in the Circumference with *Merc. præcip.* as we ſaw Cauſe.

I ſhould have oftner made uſe of the actual Cautery, and thereby laid bare all the carious Bones, and dried them up; but the Weakneſs of the Patient not permitting it, I went on for the moſt Part with *Præcipitat.* and dreſſed her twice a Week; during which the Foot recovered a better Shape, the Ulcers diſcharged not ſo much Matter, and the Patient was more at Eaſe; and the Phyſicians preſcribing internal Medicaments to correct the Acidity of the Blood, ſhe ſeemed to be in a fair Way of Recovery; but of late the Seaſon proving exceſſive cold, ſhe is often ſubject to a *Diarrhæa*, which I fear will carry her off.

Of the Diſeaſes of the Bones. By Monſieur Le Clerk, *Phyſician to the* French *King. Printed at* Paris, 1709.

WE will comprehend all the Diſeaſes of the Bones under Ten Species; to wit, the *Pain*, the *Caries*, the *Exoſtoſis*, the Softneſs, the *Anchyloſis*, the Diſpoſition for Breaking, the Crookedneſs or Rickets, the Ratling of the Bones, the Luxation, and the Fracture.

CHAP. I.

Of the Pains of the Bone.

THE Pains we ſometimes feel in the Bones, are very like unto thoſe we ſuffer in the Inflammations of the other Parts of the Body. We muſt look upon thoſe Pains as Inflammations of the *Perioſteum*; for the Bones don't ſuffer Pains any further than this Membrane is affected with it.

Some Authors are of Opinion, that the Bones are of themſelves capable of Senſation, whenever they undergo any Alteration, or are affected with a *Caries*; becauſe, ſay they, the Bones are of the ſame Nature with the Fleſh; there being no other Difference betwixt them but what ariſes from their Solidity; for they conſiſt of Veins, Arteries, Nerves, and Tendons, all which are Parts that have an exquiſite Senſe.

They pretend to prove it thus:

If you break aſunder the Bones of Animals that are lately brought into the World, you will find ſome Blood to iſſue out from thence; and you may plainly diſcover the Blood Veſſels which enter into the Bone. Even in Perſons of an advanced Age, you may perceive divers ſmall Holes, thro' which the Veins and Arteries take their Paſſage. They ſay further, that the Tendons of the Muſcles are nothing elſe but one and the ſame Continuity with the Body of the Bones, and that even the *Apophyſes* of the Bones themſelves, unto which the Tendons of the Muſcles are faſtened, are ſoftiſh in new-born Children; which ſhews, that the Tendons do enter into the Compoſition of the Bones.

The Bones, ſay they, tho' they are ſoft and membranous at firſt, do harden by Degrees; as on the other Hand, in certain Diſtempers, they loſe their Solidity, and become ſoft; which ſhews that the Membranes do enter into the Compoſition of the Bones, and theſe being of an exquiſite Senſe, the Bones conſequently muſt alſo retain this Senſibility.

They

They add, That if you touch upon a Bone that is upon the Point of Exfoliation, the Patient is ſenſible of Pain in that Part; But this Pain ariſes from thence, that under the oſſeous Lamel that is to fall off, there are raiſed abundance of ſmall Grains, which are of a Fleſh Colour, and ariſe from the ſound Bone, and thruſt this Lamel forwards, and ſeparate it from the ſound Part of the Bone: And the Circumference of this Lamel having abundance of ſmall pointed Aſperities, theſe Points will prick all the circumjacent carneous Parts, if you touch or preſs hard upon it.

Thus Pain may ariſe alſo from a Compreſſion of theſe ſmall Grains which lie underneath it; ſo that it is beyond all Doubt that this Pain owes its Origine to the ſtirring of the Bone that is ready to exfoliate. It happens almoſt in the ſame Manner in a rotten Tooth; for if you preſs hard upon it, it rubs againſt the Membranes which inveſt the *Alveoli* and the Teeth, are of a very exquiſite Senſe, and are altogether like unto thoſe that cover the Bones.

We told you before, that the Membranes which incloſe the Bones are of a moſt exquiſite Senſe. To form to your ſelf a right Idea of the Violence of theſe Pains, it is to be obſerved firſt, that all the Membranes in general of the Body of the Animal, are extreamly ſenſible of Pain, becauſe they are nothing elſe but an InterteXture of divers Threads interwoven different Ways one within another; and that conſequently, if a Diſruption happens in ſome of them, it is communicated to the reſt, as well as to the Nerves, which touch upon them.

Secondly, Theſe Threads are for the moſt Part formed by the Expanſion of the nervous and tendinous Fibres; ſo that in this Reſpect they may be conſidered as ſo many Reſervatories of the Animal Spirits, which are the principal Cauſe of the Senſibility of the Parts.

But there are beſides this, two other Things which render the Senſation of the Membranes that ſurround the Bones more exquiſite than the reſt.

The *Firſt* is, becauſe theſe Membranes are extended over the Surface of the Bones, and are faſtened to it by Means of a Thouſand ſmall Threads of the Arteries, Veins, and Nerves. Experience teacheth us, that the Extention of a Part gives it a Diſpoſition of ſuffering a Diſruption; for upon the leaſt Inflammation the *Perioſteum* becomes ſo much extended, that the ſmall Threads by which it is faſtened to the Body of the Bone are divided, and half ſeparated one from the other; and it is owing to this Separation that the Membrane is ſenſible of ſuch violent and exquiſite Pains.

Secondly, if it be conſidered, that the Membrane called the *Perioſteum* is nothing elſe but an Expanſion of ſome of the Tendons which are inſerted into the Body of the Bone, 'tis eaſy to imagine, that the Communication which is betwixt theſe two Parts, can't but contribute very conſiderably towards the Violence of the Pain of the *Perioſteum*.

We are taught alſo by Experience, that wherever there happens a Solution of a Continuity in the Tendons, it is extreamly painful, which in all Probability muſt be owing to this, That each Tendon is a Bundle or Compoſition of an infinite Number of extended Fibres; ſo that the leaſt Diſruption or irregular Motion of one of their ſmall Threads is eaſily communicated to all the reſt by Reaſon of their Extenſion and Intertexture; for, in the leaſt Inflammation, they rub moſt violently againſt one another; and this Bundle incloſes an infinite Number of others, which produce theſe exceſſive Pains.

'Tis no great Wonder therefore if the Membranes that ſurround the Bones are of a very exquiſite Senſe, ſeeing there is ſo ſtrait a Connexion betwixt them and the Tendons, which are ſo very ſenſible.

In anſwer to the firſt Objection, by which they pretend to prove that the Bones of themſelves have a Senſation, becauſe they are of the ſame Nature with the Fleſh, and differ from it only in their Solidity, it may be alledged, that there may be ſeveral Parts that belong to the Compoſition of the Bones which are alſo to be met with in the Fleſh; but that theſe Parts, which at their firſt Beginning might, perhaps, not be void of Senſation, do afterwards abſolutely alter their Nature.

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Concerning the Signs of the Pains which we imagine we feel in the Bones themſelves, there are no other excepting the Pain it ſelf we ſuffer in the adjacent Parts, and conſequently this Pain muſt be removed by applying proper Remedies to the adjacent Parts, in order to remove thoſe Diſeaſes that affect them.

CHAP. II.

Of the Caries *of the Bones.*

THE *Caries* is a Gangrene or Exulceration that happens in the Bone: For, to ſpeak properly, the *Caries* is the ſame Thing in the Bone that the Gangrene or Corruption is in the Fleſh. Experience teaches us, that theſe two Diſeaſes owe their Origine to one and the ſame immediate Cauſe, and that they are cured alſo by the ſame Remedies; for either of them are cured either by Reſolution, or elſe by Suppuration.

The Cauſe of theſe Diſeaſes is owing to a ſaline and corroſive Acidity; becauſe it has been found by frequent Experience, that nothing but the acid Liquids can penetrate into and diſſolve it.

It has been often tried, that if you do apply the Spirit of Salt or Vitriol to the Teeth, or to ſome other Bone, it will contract a *Caries*, and fall to Pieces. 'Tis upon this Score that the moſt celebrated Authors do expreſly lay this down as a general Rule, in their Treatiſes of the Wounds, to take Care to keep the Wounds and the Bones from the Injuries of the Air, which being full of nitrous Particles, produces many pernicious Symptoms.

The Air being full of ſaline, acid, and nitrous Particles,and,according to the Moderns, ſuch as are arſenical, whenever they touch upon the Bones or Fleſh, after they are ſtrip'd of their Integuments, it deſtroys the natural Temperature of theſe Parts, conſumes and alters the natural Balſam and the nutritious Juice, which ſerves inſtead of a Glue to reconſolidate the diſunited Parts.

When the Spirits in the Wound are diſſipated by the Ingreſs of the Air, the Acids eaſily do ſtick to the Fleſh of the Wounds, and with their acuminate Edges corrode and tear them aſunder, which occaſions moſt exceſſive Pains, the Cauſes whereof are very often not very well known.

The beſt Means therefore to preſerve the Teeth, and to keep them white, is to make Uſe of the volatile aromatick Salts of Animals, or of the fixed Salts, the Powder of Coral, Ivory, Crabs Eyes, Pearls, the *Terra Sigillata*, and ſuch like.

The immediate Cauſes of the *Caries*, are owing to the Stoppage of the Juices in their Pipes or *Tubuli*: And this may be done ſeveral Ways.

Theſe Cauſes are either *Internal* or *External*. The *Internal* are, when theſe Juices are coagulated, which being thus deprived of their Circulation, become acrious; and thus become the Cauſes of all the Diſeaſes of the Bones, and of the *Caries* among the reſt.

The *External* are Contuſions, Fractures, and every Thing elſe that is able to ſtop the Circulation of the Blood, the Suppreſſion of which does produce all theſe different Diſeaſes.

The Scurvy, the *French* Diſeaſe, too great Exfoliations, deep Ulcers, old *Fiſtula's*, ſimple, and ſometimes ſlight Wounds alſo are ſometimes the Cauſes of it.

It happens alſo very often that an Abſceſs ariſes in the Marrow; to wit, when the Matter which is ſupplied for its Nouriſhment turns acrious, or is impregnated with ſome other bad Leaven,which produces a *Caries* that begins inwards, and ſo goes outwards.

There is alſo a particular *Caries*, which is produced by ſeveral Ways:

(1.) When a Bone is rubb'd or hurt, it produces a *Caries*, becauſe by this Contuſion ſome Blood-Veſſels are bruiſed, and the extravaſated Blood entring into the oſſeous Fibres, turns acrious, and goes into a Corruption, which produces a corroſive Acid in the Bone, which deſtroys their Contexture.

(2.) Old Ulcers and *Fiſtula's* which are near the Bone never fail to produce a *Caries* there, which is occaſioned by a corroſive Seroſity that diſtils thence. This is frequently obſerved in the *Fiſtula* of the *Anus*, which is communicated to the *Coccyx*, and to the *Os Sacrum*.

(3.) 'Tis

(3.) 'Tis alſo often obſerved, That when the *Lympha* turns acrious, either by its being ſtagnated or detained in ſome Place, or by ſome other Cauſes, it produces a *Caries* in the Bones that are near it. This is often ſeen in the *Fiſtula Lacrymalis.*

(4.) If a Bone has been laid open, and continues ſo for a long Time, it will contract a *Caries*; becauſe the Air, which immediately touches upon it, introduces an Alteration in the nutritious Juices, and interrupts their Courſe.

'Tis upon this Account that the Ancients have adviſed to keep a Wound open when the Bones are laid open, becauſe they looked upon the Surface of a Bone that was touch'd by the Air as a dead Part.

But we have been convinced by frequent Experience, that we ought to endeavour its Conſolidation as ſoon as poſſibly can be, unleſs the Bone ſhould be very much impaired; this being the beſt Way to ſhorten the Cure of theſe Sorts of Wounds, and to encompaſs that in Six Days time, which formerly they could not accompliſh under Six Weeks. The beſt Way in the Wounds of the Head, is certainly to procure their Reunion with all poſſible Speed.

For firſt of all, it is to be obſerved, that the *Perioſteum* does ſend forth into the Bone a Thouſand ſmall Twigs of Arteries and Veins, which are inoſculated within one another in the Inſide.

Secondly, that the Pores of the ſolid Parts don't ſtick ſo cloſe together as thoſe of the fleſhy Parts do; and that for this Reaſon they afford an eaſy Entrance and Paſſage to all the Juices that are conveyed thither. And this is the Reaſon why a Bone, though it be deprived of its *Perioſteum*, does not exfoliate; for the circumjacent Veſſels furniſh it with a Supply of a Seroſity, which inſinuating it ſelf into the Pores of the diſcovered Bone, does nouriſh and maintain it in its natural State.

In ſuch-like Caſes therefore you muſt make it your main Endeavour to preſerve the natural Heat of the Part, to keep open the natural Orifices of the Pores, and to prevent the Putrefaction of the nutritious Juices: Quite contrary to what is practiſed by moſt of the Chirurgeons, which intercept all the Paſſages of the nutritious Juice which cauſes an Exfoliation.

I can't forbear upon this Occaſion to forewarn all the young Chirurgeons, not to be too buſy with their Tents in thoſe Wounds where the Bones are laid open, not to ſuffer the purulent Matter to ſtay within them, and not to make uſe of oily and greaſy Remedies; becauſe the greateſt Part of rotten Bones are the fatal Conſequences of ſuch-like prepoſterous Practices.

To convince you that the true Cauſe of the *Caries* does conſiſt in a corroſive Acidity, you need only conſider, what Remedies theſe are that are made uſe of for its Cure.

The hot Iron, for Inſtance, is the moſt effectual of all, becauſe it diſperſes Part of the carious Leaven by Exhalation, and abſorbs the remaining Part.

Next to the Fire, nothing is more efficacious than the potential Cautery, which is nothing elſe but a lixivious Salt, which in its own Nature is directly oppoſite to all Acids, which is the true Ferment of the *Caries.*

The Powder of the *Guajacum*, the camphorated Spirit of Wine, are alſo very ſalubrious; and ſo are the Crabs Eyes, the Oil of *Guajacum*, *&c.* wherewith you muſt foment the Part.

When you make Uſe of theſe Remedies, you muſt ſcrape or raſp the Part once in Three Days; but you muſt take Care not to impair the Fleſh, and to cleanſe it by Degrees.

All thoſe Species that abound in an alkalious Salt, as the *Round Ariſtolochy*, the *Iris*, the *Angelica*, the *Euphorbium*, are very uſeful. The Balſamick Tinctures, as thoſe of the *Myrrhe*, *Aloes*, and ſome Preparations of *Mercury*, are alſo of great Efficacy to touch the Venom and its very Root.

You muſt preſcribe your Patient for his conſtant Uſe, Ptiſanes made with the vulnerary Herbs, powdered Crabs Eyes, *Salſaparilla*, *&c.*

According to theſe Principles we may eaſier imagine, that as there are Three Sorts of Ulcers, to wit,

(1.) Thoſe that are very dry when the Fleſh is hard and blackiſh, and will not come to a Suppuration, and is called *Cancrous* Ulcers.

(2.) Thoſe

(2.) Thoſe that are moiſt, when the Fleſh is ſoftiſh, rotten, and falls in Pieces in the Suppuration, and are call'd putrid Ulcers.

(3.) Thoſe that keep a *Medium* betwixt both, when the Fleſh is neither too dry nor too moiſt, keeps its natural Colour, and produces a good and laudible Matter by a gentle Suppuration.

So there are Three Sorts alſo of a *Caries*.

In the *Firſt*, the *Perioſteum* being much inflamed by the corroſive Humours, is deſtroyed; and the Bone changing its Colour, turning black and very dry, does retain almoſt its former Solidity, and does not eaſily fall off. This is what Authors have call'd the *Cancer* of the Bone. The corrupted Juices running betwixt that Part of the Bone that is ſound, and betwixt that which has ſuffered an Alteration, it is deprived of its Nouriſhment, and it falls off like thin Leaves.

In the *Second*, the corroſive Humours exert their Force upon the Bone, juſt as the *Aquafortis* does upon Iron or Steel; ſo that according as the Bone is either leſs or more hard and ſolid, the Corruption is leſs or more great, and the *Caries* appears unequal and rugged: For theſe Juices exert their Vigour according to the Hardneſs of the Part of the Bone upon which they act; which having ſuffered an Alteration, grows ſoft, and falls off in many ſmall oſſeous Scales. Sometimes the Bone becomes ſo ſoft, that it comes off in the Nature of a Salt; as it is often obſerved in the *Caries* of the Teeth. This is call'd the Rottenneſs and Worm of the Bone.

In the *Third*, the Alteration of the Bone being only ſlight and ſuperficial, an inſenſible Exfoliation does enſue, which is diſcharged, together with the Suppuration of the Fleſh.

To give you a more exact *Idea* of the *Caries*, we muſt add ſomething alſo concerning Exfoliation.

The Exfoliation is a Falling-off or Separation of that Part of the Bone which has ſuffered an Alteration, and is become carious.

The Exfoliation is abſolutely a Work of Nature; for betwixt the ſound and corrupted Part of the Bone you may obſerve a certain Matter, which conſiſts of many ſmall Grains, of a Fleſh Colour, and of a roundiſh Figure, capable of Senſation, which encreaſe, and become hard by Degrees.

This is that ſame Matter which does form the *Callus*, and which thruſts that Part of the Bone that has undergone an Alteration outwards, and ſeparates and breaks the remaining Filaments wherewith it was faſten'd to the ſound Part of the Bone.

Sometimes there are ſome of theſe ſmall Grains, which thruſt outwards with ſo much Vigour, that they break aſunder the carious Bones, and preſs through the Cracks. Sometimes alſo certain fleſhy Parts appear in the Worm-eaten Bone, through the Cracks and Holes of the corrupted Part: This is a whitiſh fungous Subſtance, without any Senſation, which muſt be conſumed; but you muſt take Care not to impair the new ſound Fleſh.

This Fleſh, which grows hard by Degrees, conjoins the Skin with the Bone, which has no *Perioſteum* in this Place: And for this Reaſon it is, that the cicatrized Bones are depreſſed where there has been an Exfoliation. This is particularly remarkable in the *Epiphyſes*, becauſe in theſe the Exfoliations are very large, the Veſſels not furniſhing them with a ſufficient Supply of Nouriſhment.

It muſt alſo be obſerved, That ſometimes a Bone, though it be very much ulcerated and turn'd black, will nevertheleſs be covered with Fleſh, without any Exfoliation, till ſome Time after the Wound is heal'd up, and this produces a freſh Abſceſs in that Place.

A Chirurgeon ought to learn how to diſtinguiſh the Fleſh which covers the ſound Bone, from that which covers the ulcerated. In the Firſt, the Fleſh is plump, red, ſenſible, and covering the whole Surface of the Bone: In the Second, on the contrary, the Fleſh appears to be only an Elongation of the adjacent fleſhy Parts. 'Tis ſoft, ſpongious, white, and leſs ſenſible than the other. It gives Way to the Touch, and you may perceive it to riſe upon the Bone.

The Difference of the Exfoliations is taken chiefly from the Age and the Texture of the Bone. In Children and young People the Exfoliation proves always moſt expeditious.

(1.) If

(1.) In Reſpect to the Quantity and Quality of the Juices.

(2.) In Reference to the Conſiſtency of the Bones.

In young People there is a copious Supply of Juices, which abound in alcalious Salts: They are eaſily coagulated. The Fibres of their Bones are ſoft, pliable, and eaſily admit of a Dilatation, and conſequently afford a free Paſſage to that copious Supply of the nutritious Juice; and therefore it is no Wonder to ſee theſe ſmall Grains to appear ſo ſoon, and that even above the corrupted Bone.

In a ſlight and ſuperficial *Caries* of the Bone, the Exfoliation is performed in an inſenſible Manner.

In Perſons of an advanced Age, the Exfoliation goes on much more ſlow, becauſe they have but a ſlender Share of the nutritious Juice, and the Fibres of the Bones become more dry, hard, and cloſe, as the Perſon advances in Years. In decrepit People, there is ſcarce any Remainder of this Juice. Their Fibres are exceſſive hard, and altogether inflexible; and conſequently the Generation of a new Fleſh requires ſome conſiderable Time.

From what has been ſaid it is evident, That let the Age of the wounded Perſon be what it will, the harder and more compact the Contexture of the Bone is, the ſlower the Exfoliation does proceed.

Unto this muſt be added, That the Seaſon, the Temperament, and Diet, may contribute not a little to facilitate the Exfoliation: As for Inſtance; the Spring Time, a ſanguine Temperament, and a regular Way of Living, do facilitate the Exfoliation.

Neither muſt we forget to mention, That proper Remedies do contribute very much towards the Accompliſhment of this Falling off of the carious Bone. 'Tis ſufficiently known, that the Spirits of Salt and of Vitriol, the Oils of *Guajacum*, of Paper, of Honey, of Antimony, are often made Uſe of to procure this Exfoliation: But I think my ſelf obliged to give this wholeſome Advice to our Chirurgeons, not to apply ſuch-like Remedies but with the utmoſt Circumſpection; or rather (to be plain with them) to let them quite alone. 'Tis true, by Means of the Application of theſe corroſive Remedies, they may ſometimes procure a more ſpeedy Exfoliation; but it is undoubtedly true alſo, that oftentimes they give Birth to a Diſeaſe, which is worſe than the Firſt; for the Operation of theſe Spirits is not to be managed and determined ſo exactly, but that they will penetrate to the ſound Part of the Bone, and conſequently to that ſoftiſh carneous Subſtance which ariſes from thence.

None of theſe Remedies muſt ever be applied to the Skull; for I can aſſure you, I have ſeen them to have been followed by very fatal Conſequences. I remember a Quack, who having applied ſome of theſe Remedies to a Patient, they did corrode the Two Tables of the Skull, and this Corroſion having cauſed a Gangrene in the *Dura Mater*, the poor Patient died under moſt tormenting Pains.

In a ſpongious *Caries* you may make Uſe of the *Butirum Antimonii*, or of an actual Cautery, which is much better; for if it be applied to thoſe Bones that are very dry, you may ſee the acrious corroſive Vapours ariſe or evaporate from thence, being the ſame that were the true Cauſes of the *Caries*.

Some Inſtances of the Caries.

(1.) A Certain Perſon in the Hoſpital of *Charity* of *Paris*, was afflicted with an *Aneuriſme* upon the *Dura Mater*. On the Outſide there were ſeveral Tumours, which being open'd by Monſieur *Marechal*, there iſſued thence a very florid and laudable Sort of Blood, ſuch as is commonly obſerved in the *Aneuriſmes*; but ſoon after he died in moſt tormenting Pains. The Skull being open'd, we found it half carious, and ſpongious, ſticking cloſe to the *Dura Mater* on the Inſide, and to the *Pericranium* on the Outſide. The *Caries* had its Beginning on the interior Part, and had penetrated to the exterior Part of it.

(2.) A certain Perſon being for above Two Years afflicted with moſt tormenting Pains in the Head, without Intermiſſion, was brought to the Hoſpital *de Dieu*, where he became blind. He had a Tumour upon the Temple behind the Ear, which contained ſome Blood, which appeared juſt like that

in the preceding Account. He happening to die ſoon after, and the Head being opened, the Integuments were found to be callous, the Skull carious and ſpongious, but the Brain very ſound.

There was a religious Perſon alſo who laboured under the ſame Diſeaſe, but the Violence of the Pain was ſuch, as made him turn an Idcot.

(3.) One in the Hoſpital of the *Invalides* having received a Blow upon the *Os Frontis*, near the Sagittal Suture, he was ſoon cured of the Contuſion: But about Ten Years after a Tumour did appear in the ſame Place, but without any Pain. The Chirurgeon taking it for a ſimple Tumour, did open it, and found a purulent Matter to iſſue thence; that the Integuments were callous; and that the Two Tables were corroded about the Bigneſs of a Crown-Piece.

In the *Hotel-Dieu* we have met with many Skulls that were become carious; and among the reſt, the *Os Coronale* of an Infant that was thus affected with a *Caries*. We have, beſides theſe, ſeen here alſo divers Bones of the *Cubitus* and *Radius*, which were almoſt wholly exfoliated; as alſo a *Tibia*, that had been ſawed aſunder in the Middle. 'Tis to be obſerved, That the *Tibia* moſt commonly does contract a *Caries* on its interior Part, becauſe it is not ſo well covered there by Integuments as on the exterior Part, and conſequently the Air is more apt to infect it.

Theſe Bones were all black; but in thoſe Places where they had been touched by the Air, or by the Medicines, they appeared rugged, becauſe ſome Parcels of the Fibres were harder than others, and conſequently the corroſive Juices did corrode one Part more than the other.

Sometimes it happens that the whole Body of the Bone has contracted a *Caries*, but the *Epiphyſes* at the ſame Time are free from it. In ſuch-like Caſes, if there be a Wound in the Middle, you muſt lift up the Bone as much as you can with proper Inſtruments, and then ſaw it aſunder in the Middle, and afterwards draw out the Pieces with a Pair of Pincers, or with the Inſtrument call'd the *Raven's-Beak*, one after another.

But in caſe the Bone proves ſo ſoft and tender, as not to be handled, or managed by the Saw, you muſt apply the Trepan in divers Places, and by this Means ſeparate them in Two, and afterwards draw them out as before. If the Wound happens to be at the Extremity of the Bone, you muſt draw it out only at that End; and if there be any Splinters, theſe muſt be taken out likewiſe after the ſame Manner.

The balſamick Tinctures are the moſt proper Remedies in theſe Diſeaſes, becauſe they produce Two moſt ſurprizing Effects.

(1.) They blunt the ſharp Edges of the corroſive Juices, which produce the Ferment of the *Caries*, and conſequently ſtop their Progreſs.

(2.) So ſoon as they penetrate to the Grains of the new Fleſh which ariſes from underneath, they cover it as it were with a Varniſh, which checks the Operation of theſe Juices, and of the exterior Air.

The Exfoliation of the Cartilages is ſubject to more Difficulty, and proves much more ſlow than that which happens in the Bones. In all Probability, this depends on Two different Cauſes, to wit, their Contexture, and the Juices wherewith they are moiſten'd. Their Elaſtick Virtue ſeems ſufficiently to intimate, that they are compos'd of ſuch Fibres as are interwoven one within another, which renders their Separation the more difficult.

The Juice that nouriſhes them is very viſcous, and conſequently more proper to reſiſt the Impreſſions made by the Air, which is the principal Cauſe of all other Exfoliations.

CHAP. III.

Of the Exoſtoſis.

THE *Exoſtoſis* is a Tumour that is raiſed upon the Surface of the Bone.

This Tumour is moſt commonly attended with violent Pains; for by its Encreaſing and Riſing inſenſibly, it ſtretches, raiſes and tears into Pieces the *Perioſteum*, which (as every Body knows) is a Membrane of a moſt exquiſite Senſe.

The Pain encreaſes in Proportion as the Tumour does augment in Bulk; for the *Perioſteum* being very much extended, if the Matter which tranſudates from the Tumour

is very ſharp, it produces almoſt inſupportable Pains, becauſe it occaſions an Inflammation in this Membrane, which will be leſs or more according as the Matter that produces it is more or leſs corroſive.

The nutritious Juice of the Bones does not at all Times keep its regular Courſe in their ſmall Conduits or *Tubuli*; for ſometimes it is ſtopp'd or fix'd either by the Indiſpoſition of its Parts, or elſe it is coagulated by the Superfluity of acid Particles.

Thoſe Juices that are ſupplied afreſh finding their Paſſage interrupted, ſtrike with ſome Violence againſt the Sides of theſe ſmall Pipes, and by theſe reiterated Impulſions they do relax and dilate their Contexture in ſuch a Manner, as to make them encreaſe conſiderably in their Bulk in thoſe Places, which is what we call a Tumour, being nothing elſe than a Swelling of the ſolid Part of the Bone: Juſt as we ſee the Branches of the Trees to grow thicker under that Place where the Courſe of its Juice has been ſtopp'd. This is the Firſt Kind of *Exoſtoſis*, which is call'd a Node, and is often obſerved in thoſe that are infected with the *French* Diſeaſe.

Sometimes the nutritious Juices do go beyond the ordinary Bounds of their Conduits, by the Action of ſome acid Corroſive; ſo that the Extremities of the Veſſels being opened, they produce a Second Kind of Tumours of the Bones, or of the *Exoſtoſis*: For by the continual Supply of theſe Juices, which being extravaſated, are fixed and coagulated in the Nature of a Rock, and that leſs or more irregular, according to the Diverſity of the Motion, the Quantity of the Matter, and the different Configuration of the adjacent Parts or Places. Thus we ſee in the Trees and Plants, the Juice, when it happens to iſſue out by the Interpulſe of ſome acrious Juices, or through the ſmall Apertures made by the Stings of ſome Inſects, to produce different Sorts of Tumours, moſt of which ſerve for Habitations to theſe little Creatures.

Sometimes it happens alſo, That the oſſeous Fibres are relaxed in an extraordinary Manner, being occaſioned by the nutritious Seroſity being detained in the Fibres, where it continues its Courſe in the Form of a Juice to the Surface, but then loſing its Liquidity inſenſibly by the Expiration of its moſt volatile Parts, it grows thick, and is coagulated in the Nature of an Ice or Gum betwixt the *Perioſteum* and the Body of the Bone; and it being only fixed to the Surface of the Bone, it may be eaſily removed. This makes the Third Kind of the *Exoſtoſes*, which were call'd *Gums* by the Ancients.

There is a Fourth Kind of an *Exoſtoſis*, which happens when the Bone is broken at its whole Length. This is owing to the Softneſs of the Bone, which is furniſhed with too great a Supply of Nouriſhment; but this Juice which is received by theſe Bones is moſt commonly vitious, which is the Reaſon that this Sort of an *Exoſtoſis* is rarely ſeen without a *Caries*.

Sometimes there happens an Abſceſs in the Bone, very like unto thoſe that are obſerved in the fleſhy Parts; that is to ſay, the Bone ſwells or grows big at its Extremity towards the *Epiphyſes*, becauſe they are ſofteſt in thoſe Parts, and all its oſſeous Cells are full of a purulent Seroſity.

The *Cubitus* of a certain Soldier belonging to the Hoſpital of the *Invalides* being weigh'd after his Death, did alone weigh Ten Pounds Weight: And not long ago, a Knee which Monſieur *Merry* ſhew'd at the Academy, did weigh no leſs than Twenty Pounds.

Theſe Tumours do moſt frequently attend Three Sorts of Diſtempers, to wit, the *French* Pox, the Scurvey, and the Rheumatiſm, but chiefly the Firſt.

They do affect either the whole Body of the Bone, or ſome Parts of the Body of the Bone, or elſe alſo its Extremities, called the *Epiphyſes*.

The Firſt of theſe are very painful, hard, and compact, and degenerate into an Abſceſs after ſome Years Time; which happens Two different Ways: When the *Caries* begins either at the Surface of the Bone, or at the interior or inferior Part. Before they come out the Patient is moſt commonly afflicted with very acute Pains in the *Perioſteum*, which do augment as the Tumour does encreaſe, and which continues thus till it be perfectly cured.

Thoſe that happen at the Extremities grow much bigger by Reaſon of the ſpongious Subſtance and Contexture of the *Epiphyſes*; but they are not quite ſo painful,

by reaſon of the Quality of the Matter, which is leſs active.

The *Epiphyſes* being not inveſted with the *Perioſteum*, do often ſwell to a great Bulk; as may be ſeen in the ſmall Bones of the *Carpus*, and thoſe of the *Tarſus*. Some of theſe after a little Time do diſappear again, either by the Help of certain Remedies, or elſe by the Qualification of the Matter, as is often obſerved in Infants.

But others degenerate into an Abſceſs, and become exceeding painful, and the liquid Matter that runs from them does corrode the Ligaments and Tendons that lie near them. The Pain that attends theſe Tumours being very acute, and not unlike unto that which we feel when a Thorn pricks us in the Joint, hence it is, that the Authors have given the Name of *Spina Ventoſa* to this laſt Kind.

The Cure of theſe Sort of Tumors muſt be regulated according to the different Conditions they are in.

The *Exoſtoſes* are beſt of all cured, eſpecially in pocky Perſons, by a good and well-managed Salivation; and if they begin to come to a Corruption, you muſt, beſides the internal Remedies, have Recourſe alſo to manual Operation, to Burning, in order to remove the carious Part.

If it come to an Abſceſs in the Joint, there is no other effectuall Remedy or Cure, but what is encompaſſed by an Amputation of the Part. 'Tis true, there are ſome Inſtances when theſe Tumours in the Joints have been cured without an Amputation; but whenever it happens thus, it is a Piece of Work that requires a great deal of Time, and much Care: But after all, whenever the whole Bone is affected with an *Exoſtoſis*, there is no other Way left than an Amputation.

Thoſe *Exoſtoſes* or Nodes that break out on the Bones of the Head, are harder to be cured than the others. The ſame Thing is obſervable concerning the *Caries* of this Part.

There are a great many Inſtances which may convince us, That the *Exoſtoſes* of the Firſt Kind may be attenuated or diſperſed; that is to ſay, if the Tumour is of the Bigneſs of an Egg, Three Part of it may be diſpelled; and though there will remain a ſmall Prominency in that Part, it is nevertheleſs very ſound, for the Patient feels not any Pain, nor any other Inconveniency. This, as I ſuppoſe, may be conceived to happen in the following Manner:

The nutritious Juices, which have been fixed and coagulated by the Pocky Acid within the Conduits of the oſſeous Fibres, and which have dilated them, (as has been ſaid before) being attenuated by the *Mercury*, ſome Part of it is carried off by Tranſpiration, and the remaining in the Veſſels is evacuated by the Salivation; ſo that the Inſides of the Fibres being well cleanſed, ſettle together: But becauſe they have ſuffered a conſiderable Change in their Extenſion, the Bone muſt of Neceſſity retain a Protuberancy in that Place where the Fibres have taken up a larger Compaſs before.

The Tumours call'd the *Gums* may be diſperſed alſo by proper Remedies.

CHAP. IV.

Of the Softneſs of the Bones.

BEfore we enter upon a particular Account of the Softneſs of the Bones, take theſe following Obſervations:

(1.) That if you macerate the Bones of a Hog for a long Time in Oil, they will become ſo tender, as to be eatable.

(2.) That the Bones may be ſoften'd in the Engine of *Papin*, which is not to be done in a Pot or Kettle in the Air, though you boil them never ſo long.

(3.) That the Horns, which do approach very near to the Nature of the Bones, will be made ſoft in warm Water; and that the Horns of thoſe Animals that feed in Marſhy Grounds are naturally ſo ſoft, that they are not fit for Workmanſhip: Whereas on the contrary, the Horns of thoſe Beaſts that live in Rocky Grounds are very compact and ſolid.

(4.) That there is a very near Relation betwixt the Cartilages and the Bones, becauſe moſt of the Cartilages turn into Bones: And it is very well known, that the Cartilages, if macerated for ſome Time in warm Water, will be ſoften'd, and turn into a Siſe.

(5.) That

(5.) That the Branches of the Trees, which appear hard and ſolid during the Winter, do grow ſoft and tender in the Spring, when they are moiſten'd by their natural Juice. When it happens to be a Rainy Seaſon, they will become ſo tender, that they are eaſily broken off by the Wind.

All which Inſtances may ſerve to ſhew us, That the Bones, as well as ſeveral other Bodies, that are of a hard and ſolid Nature, as they are, may be mollified in warm Water, or in oily Liquors, by a long continued Maceration.

It is reaſonable therefore to imagine, that when the Juices which ſerve for the Nutrition of the Bones do abound in ſaline and acrious Salts, and that they are over-fill'd with Marrow, they muſt of Neceſſity be mollified. This ſerous Juice produces the ſame Effect in the Bones as it does in the Trees and in the Horns; for as it inſinuates it ſelf into all the Parts of the Bone, and it being fluid, it produces this Effect, that all theſe Parts betwixt which it is entangled are ſoften'd, and conſequently are apt to be carious when they are preſs'd upon by ſome external active Matter.

What adds to or increaſes this Softneſs, are the ſmall oleaginous Particles of the Marrow, which inſinuating themſelves in vaſt Numbers betwixt all the Interſtices of the Fibres, do of Conſequence relax their Contexture.

From what has been ſaid it is evident, That a Bone may become ſoft, without being affected with any of the before-mentioned *Species* of the *Caries*: But there is one Thing more to be obſerved, That there is never a Softneſs in the Bone without ſome Remnant of the Rickets: Whereof we ſhall ſpeak more anon; and that the beſt Remedies are Sudorificks, Diureticks, and Abſorbents.

CHAP. V.

Of the Diſpoſition of the Bones to a Fracture.

IT has been found by frequent Experience, that ſome Bones have been fractur'd without any conſiderable Violence, becauſe divers Obſervations of this Kind have been made by Authors of good Authority; and among the reſt, by *Fabricius Hildanus*. A Man, (ſays he) who not long before was cured of the *French* Diſeaſe, as he was walking along his Chamber, was ſeen to break both his Thigh-Bones at once.

To ſpeak in general, that which diſpoſes the Bones to break aſunder is, That their Parts being not well united together, or touching upon one another but ſlightly, they are ſoon apt to be divided by the leaſt Force that falls upon them, which may happen in divers different Ways.

(1.) For Want of Nouriſhment; for 'tis then that the Moiſture which had remained within the Contexture of the Bone, is by the Heat of the adjacent Parts diſpell'd by inſenſible Tranſpiration, and as it evaporates, it ſeparates, and carries along with it ſome Particles of the Bones; ſo that they become porous, friable, and are diſpoſed to Fractures; much in the ſame Manner as the Bones are that have been expoſed to the Air for a long Time. Hence it is, that the Bones of aged Perſons are more apt to be broken than thoſe of young People: Juſt as we ſee the old Branches of Trees to break much eaſier than the Twigs of young Trees, but eſpecially in the Winter.

(2.) If, beſides this Interception or Want of the nutritious Juices, the Maſs of Blood diſcharges that Way abundance of corroſive and penetrating ſaline Particles, which do paſs and repaſs through the Pores of the Bones, they will bruiſe ſome of them, carry along others which are entangled with them, and thus in a Manner do calcine the whole Body of the Bone, which by this Means will become like unto thoſe we meet with ſometimes in the Field, which having been expoſed for a conſiderable Time to the Air, are turn'd very white and hard, but at the ſame Time very dry, friable, and apt to be broken.

This Alteration in the Bones is plainly to be ſeen in the Bones of ſome pocky Perſons, and more eſpecially in thoſe that are affected with the Scurvey, in which the Juices are more active and more penetrating; tho' ſometimes they are obſerved alſo in ſome People that are free from either of theſe Two Diſeaſes.

The

The Want of or any Alteration in the Marrow may alſo contribute not a little to this Diſeaſe of the Bones, becauſe it upholds the Suppleneſs of the oſſeous Fibres: And if it be in too ſmall a Quantity, or very thick, the Fibres acquire a Diſpoſition for fracturing, and the whole Bone becomes brittle.

It alſo happens ſometimes, that when a *Caries* ariſes on the interior Side, and without Pain, becauſe it has not reached as yet to the *Perioſteum*, there is but one ſound Table left, and therefore it is very apt to break in theſe Places by the leaſt external Violence.

The Account we have given you of the Ulcers of the Bones is very agreable to what may be obſerved in the Trees.

For the Branches are very much diſpoſed to be broken during the Winter Seaſon, for Want of their natural Juice, and by the Tranſpiration of many aqueous Particles, and ſome other ſolid Parts. They are apt to be broken to Pieces by the leaſt Force of the Wind, for the Inſide is rotten, though the Rind or Bark is ſound and entire.

CHAP. VI.

Of the Incurvation of the Bones, or of the Rickets.

THE Bones may ſuffer an Incurvation either in the Mother's Womb or after the Birth. They may become crooked in the Womb by ſome Blow or Fall which may be given or happen to the Mother during the Time of her being with Child, or elſe by her Imagination, which may cauſe a Commotion in the Humours of the Child, and make it bear a Share in the ſame Paſſion. Sometimes the Bones alſo happen to be incurvated during the Time of the Birth by the Fault of the Midwife, who ſometimes is apt to handle the tender Bones with too much Roughneſs.

After the Birth the Bones may be incurvated, in caſe the Parts do remain for too long a Time in the ſame Situation, and then it is the Nurſe's Fault; or elſe by ſome Diſeaſe, which proving very painful to the Child, is apt to keep it ſelf always in the ſame Poſture.

In all theſe Caſes the Bones being detain'd for a long Time in the ſame Situation, do keep that Figure they are in; juſt as we ſee the Gardiners do with the young Trees, the Branches whereof they turn and twiſt at Pleaſure.

Laſtly, the Bones are incurvated alſo in that Diſtemper which is by the Phyſicians call'd the Rickets.

To explain in what Manner this Incurvation is made in the Bones, you need only to conſider how it comes to paſs that the Wheat-Helm will bend towards the South, and that Paper, Parchment, and Bread, if held to the Fire, will bend to that Side where the Fire is.

In all theſe Caſes, that Side which is expoſed to the Sun, or to the Fire, is much dried; ſo that the Juices which fill up the Poroſities are in Part diſſipated, and in Part thruſt into the Interſtices of that Part which is not turn'd to the Sun or the Fire, and are like ſo many Corners, which ſerve to dilate all the Interſtices of the Fibres, and conſequently force them to bend towards that Side which is expoſed to the Sun or the Fire.

The unequal Diſtribution of the Nouriſhment in the Bones is able to produce the ſame Effects; for that Part of the Bone which receives the greateſt Supply of Nouriſhment being of Neceſſity tumefied, forces the other to bend in the ſame Place; for the nutritious Juice, which moves in a great Quantity in all the Intervals of one of the Parts of the Bone, makes the Fibres to encreaſe or lengthen without Intermiſſion, whilſt at the ſame Time thoſe on the other Side grow dry, and are ſhorten'd for Want of Nouriſhment. Thoſe Fibres that are thus ſhorten'd more on one Side than the other, perform here the Function of a Bow, and conſequently force thoſe on the oppoſite Side to bend. 'Tis upon this Account that we commonly do rub the concave Side of the Bone with warm Linen Cloths, or that we apply here certain Liniments made of Balſams abounding with volatile and ſpirituous Parts, both to draw that Way the Spirits and natural Heat, and to open the Pores, in order to bring back into that Part the

the nutritious Juices; which penetrating into the Interſtices of the Fibres whereof the Bone is compoſed, together with the moſt ſubtile Parts of the Blood and the Juices, you may by this Means procure an Elongation of the Fibres. In the mean Time you muſt endeavour to make a Depreſſion upon the prominent Parts of the Bones, by Splinters, Bandages, and other Inſtruments.

This Syſtem, the Firſt Inventor whereof was *Gliſſon*, an *Engliſh* Phyſician, though it carries a great deal of Probability along with it, is nevertheleſs ſubject to no ſmall Difficulties: For how is it manifeſt to us, That the Bones receive a greater Supply of Nouriſhment on one Side than on the other? For the nutritious Juice is equally diſperſed through the Bones, as may be ſeen if you ſaw a Bone aſunder. If there were any ſuch Thing as an unequal Diſtribution of the nutritious Juice, the poſterior Part of the *Tibia* muſt of Neceſſity receive a greater Share of Nouriſhment than the fore Part, becauſe it is leſs expoſed to the Cold; and ſo, according to the ſame Suppoſition, the *Tibia* muſt be convex behind, and incurvated before; a Thing that has never been obſerved in this Diſeaſe.

Another ingenious Syſtem has been invented to explain the Incurvation of the Bones, or the Rickets; for (ſay they) we muſt enter upon an Examination of the Reaſon, why in this Diſtemper the Tendinous Strings of the Muſcles become rigid and inflexible, and grow dry for Want of Nouriſhment, though the Bones are ſound.

The Bones (ſay they) unto which theſe Strings are faſten'd at their Extremities, do receive a ſufficient Supply of good Nouriſhment; but notwithſtanding this, the Bones are incurvated near that Place where theſe Tendinous Strings are ſhorten'd, in the ſame Manner as if you ſhould tie a Cord to the Stem of a young Tree, which would force the Stem when it is growing to bend towards that Side where the Cord is faſten'd.

But in my Opinion, Two very conſiderable Objections may be made againſt this Aſſertion: The Firſt is, That moſt of the Bones that are equally extended by the Strings of the Muſcles, are nevertheleſs ſubject to Incurvations, as may be ſeen in the Bone of the Arm, and in the Thigh-Bone.

The Second is, That there are no Tendinous Strings which are faſten'd to the Two Extremities of one and the ſame Bone; but they are fixed to Two Points of different Bones, and take their Paſſage either above or elſe on the Side of the Joint; ſo that, according to this Suppoſition, all theſe Incurvations muſt happen in the Joint, this being the Place that is moſt diſpoſed to give Way, and to extend and elongate it ſelf by the Means of theſe Strings: As for Inſtance; If a Cord were tied to both Ends of the Stem of a Tree, the Tree would be incurvated in the middle Part.

What they add concerning the Compreſſion of the Conduits of the Marrow, and that the Bones do grow faſter than the Muſcles, is a falſe Suppoſition, becauſe there are Inſtances of Children that have had the Palſey for Three Years together, without any Incurvation of the Bones: And ſuppoſing that the Bones were nouriſhed without the Muſcles, this would produce only an *Enchyloſis* of the Firſt Kind, but not an Incurvation of the Bones.

They further ſay, That becauſe the Tendons of the Muſcles are always pulling the Bones of the *Carpus* and of the *Turſus*, this hinders their Growth; ſo that the nutritious Juice running along the ſmall Bones, they are not lengthen'd without producing Nodes in thoſe Places where they are ſofteſt. This is a falſe Aſſertion, becauſe the Hands and Feet are never affected with this Diſeaſe.

The *Spine* (ſay they) is incurvated in the Shape of a *Roman* S, which depends upon the different Ways of the Faſtenings of the Muſcles. The exterior Muſcles, which are placed at the ſuperior Part of the Spine, make it convex on the Inſide, and the Muſcles that are fixed to the interior and inferior Part of the Spine, as the *Pſoas*, do make it bend outwards; but this Incurvation of the Spine like a *Roman* S does not depend on the Application of the Muſcles, becauſe the *Muſculi Vertebrales* are much ſtronger than their *Antagoniſts*; ſo that if this Suppoſition were true, the Spine muſt be wholly incurvated outwards like a Bow, and be convex within, which it is not.

So that we muſt endeavour to find out another Reaſon for the Incurvation of the Bones; but before we enter upon that Head, let us firſt take a View of thoſe Signs that attend this Diſeaſe.

About the Time when the Teeth begin to appear in Infants that are afflicted with this Diſeaſe, all the Parts below the Head are very lean, but all the Joints prodigiouſly big, their Belly is very thick alſo, as well as the Head; the Breaſt is cloſe, and the Sides flat, the *Sternum* ſtands pointed outwards, the Bones of the Arm, of the fore-Arm, and of the *Femur*, are incurvated backwards, the Bones of the Leg outwards, but the Hands and Feet keep always well. The Extremities of the Ribs that are conjoin'd with the *Sternum* are large and hollow, as alſo their Extremities near the *Vertebræ*, but theſe are not quite ſo big. The interior Surface of the Ribs is always wrinkled, the *Vertebræ* are very cloſe one upon the other, and the Spine is incurvated in the Shape of a *Roman* S. The *Oſſa Ilia* are very ſtrait, and ſtand more inwards towards the *Os Sacrum*. All the Bones are very ſoft, and if you ſqueeze them immediately after the Child is dead, you will ſee the Marrow come out intermix'd with a little Blood, and if they are kept for a long Time, they will grow hard; but if you macerate them for 24 Hours in Water, they will be as ſoft again as before. This Softneſs in the Bone will ſometimes continue when they grow up, tho' ſometimes alſo they become hard.

After the Death of the Infant, you will find the Liver much bigger than it ought to be in its natural State. The Spleen is alſo very large. In the Belly you may ſometimes ſee ſome Water, the Glands of the *Meſenterium*, and of the *Pancreas*, are very much ſwell'd, juſt as they are obſerved in ſcrophulous Diſeaſes. The Lungs are coherent to the *Pleura*, and are beſides this hard, Scirrhous, and livid; the Glands of the *Mediaſtinum* are alſo very large, the Heart is ſound, the Brain is the ſame, but very large, and the Ventricles are ſometimes fill'd with Water; the *Carotides* and the internal Jugulars are much larger than ordinary.

But let us enter upon an Examination of the Cauſe of this Diſeaſe.

All the Bones of the Body are naturally ſomewhat incurvated, eſpecially outwards. It is to be obſerved, that the *Epiphyſes* do augment this Incurvation, becauſe the Bones are always apt to be incurvated on that Side where they are naturally ſo. Now the Bones being always ſoft in this Diſeaſe, by Reaſon they are moiſtened by the *Lympha*, (whereof we ſhall give you the Reaſon anon) and the Humours which contract an Acrimony during the Time of the Breeding of Teeth in Children; this, joined to the Softneſs of the Bones, ſtimulates the Muſcles to draw or ſhorten themſelves together without Intermiſſion; and the Stronger always prevailing over the more Feeble, the Incurvation bends to that Side, and the Weight of the Child, whilſt it is walking, does the more incline the Bones to incurvate towards the Side of their natural Incurvation, which is always to happen thus in this Diſeaſe.

The Bones of the Arms are never ſo much incurvated as the other Bones are:

(1.) Becauſe their natural Incurvation is not ſo great, their *Epiphyſes* being not ſo long, and conſequently the Muſcles pulling very near alike, this Incurvation can't be very great.

(2.) Becauſe Infants don't lay moſt Streſs or Weight upon theſe Parts, but much more upon their Thighs and Legs.

The Ribs are drawn upwards by the pectoral Muſcles, and pulled downwards by the Muſcles of the *lower Venter*, and conſequently they are flattened, and preſs upon the Lungs on both Sides, and the *Sternum* is by the ſame Conſequence thruſt outwards; which makes ricketty Children have always a ſharp Breaſt.

The Ribs being thus drawn flat together, force the nutritious Juice that is conveyed thither without Intermiſſion into the ſofteſt Parts; and thus the Extremities which are joined to the *Sternum*, which are the ſofteſt, are moſt ſupplied with it; as alſo the Ends that are conjoined with the *Vertebræ*, which are ſofter, and leſs depreſſed than the middle Part, and ſo the Nodes are generated at both their Extremities.

'Tis to be obſerved, that in the middle Part of any Bone that is affected with an Incurvation, the Marrow does diſappear, becauſe

cauſe the Two Sides of theſe Conduits or *Tubuli*, by drawing cloſe to one another, do thruſt the Marrow towards the Two Extremities of the Bones, juſt as you may ſee in a Pen, which if it be ſqueezed hard, its Two Sides will approach near to one another. In the ſame Manner, the middle Part of a Bone being ſqueezed together, and its Extremities not quite ſo hard as the middle Part, the nutritious Juice is always thruſt towards the Places next to the Joints; and this is the Reaſon why they are ſo much tumefied.

The Incurvation of the Spine is owing to the Relaxation of the *Muſculi Vertebrales*, and to the ill Situation or Poſition that is given to the young Children. The beſt Way to hold them, is to keep them upright in the Back, for when they are Walking they are apt not to keep in a ſtrait Line, but to decline from one Side to the other, which introduces an ill Conformation in the Spine.

The *Oſſa Pubis* and *Ilium* are drawn inward by the Muſcles of the *lower Venter*. The Belly is always big, becauſe the Liver, the Spleen, and the Glands of the *lower Venter* are very ſoft; ſo that the nutritious Juice being gathered there in a great Quantity, they are apt to be tumefied.

The Difficulty therefore of Reſpiration, which is to be obſerved in ricketty Children, does owe its Origine to the ſtraitning of the Breaſt, which prevents the free Extenſion of the Lungs; ſo that thoſe Particles of the Blood that are deepeſt entangled there being check'd in their Motion, this produces firſt Obſtructions, and theſe afterwards a Tumour, which ſometimes comes to a Suppuration, and the enſuing Exulceration is the Cauſe that makes them ſtick to the *Pleura*.

The Head is very big, becauſe the Brain being very ſoft, it receives the more Nouriſhment, and alſo increaſes the Bulk of the Skull, that being ſoft alſo.

The Parts that are raiſed and affected in the Head are as follow:

(1.) The *Os Frontis*, in Two Places; becauſe at that Time it is exceeding ſoft, by Reaſon of the Aperture called the *Fontanella*.

(2.) The *Os Occipitis* is alſo very ſoft, becauſe at that Time the *Sutura Sagittalis* and *Lambdoides* are membranous, as well as the *Fontanella*. The Brain being apt to receive a great deal of Blood, it conſequently ſeparates abundance of Spirits, and Children leading a ſedentary Life, their Spirits are not much employed in the Motions of the other Parts, and conſequently are conveyed in a greater Quantity to the Organs of the Senſes; which is the Reaſon that the ricketty Children are much more ſenſible for their Age than other Children.

The *Lympha*, which moiſtens the Bones, and which occaſions their being ſo ſoft, contracts an Acrimony, and corroding the Surface of the Bone, gives Riſe to what is called the Rickets, which proves very dangerous if it be not cured before the Fifth or Sixth Year of Age; for the Patient will remain ſickly all his Life-time.

Poor People's Children are more frequently afflicted with this Diſeaſe than others, becauſe their Food is of an ill Digeſtion. The Children of the richer Sort are ſometimes alſo not free from this Diſeaſe; and here it depends chiefly on the ill Management of their Nurſes.

As for the Cure of this Diſeaſe, you muſt always keep the Bodies of ricketty Children open, by Means of Clyſters and Purgatives, ſuch as are called *Hydragoges*, ſuch as the *Scammony*, the *Mercurius dulcis*. Proper Liniments and Unctions are of very great Uſe in this Diſtemper. You may purge the Body with good Succeſs with *Jalap*, *Manna*, the Syrup of Cichory, or of Roſes. You may order Diuretick and Sudorifick Ptiſanes of the *China*, *Salſaparilla*, *&c.* Abſorbent Powders, ſuch as are qualified to correct the Acids. The Chalybeat Wine or Infuſion, Veſiccatories, Cauteries, warm Baths, Frictions, and ſeaſonable Exerciſes, are very uſeful.

When you obſerve the Nodes to begin to grow leſſer, it is requiſite you ſhould keep the Bones ſteady and firm, and to aſſiſt Nature by Bandages and other ſuch-like Things. If the Incurvation is in the Spine, you muſt make Uſe of Stays of Iron, or of Whalebones. To keep the *Clavicula* right, you muſt make uſe of an Engine made in

Form of an Iron Croſs. For the Legs you muſt have a Kind of Boots, *&c.*

Now let us ſee how the Bones are brought to their natural Condition and Station again.

'Tis therefore to be obſerved, that the Softneſs of the Bones is owing to the ill Diſpoſition of the oſſeous Fibres, and to the aqueous and acrimonious Juices that fall upon them. 'Tis therefore that you muſt endeavour to harden the Bones, and to prevent the acrimonious Juices from acting upon them, by rendering them more ſolid; which being effected, the nutritious Juice beginning to circulate as before, and with the ſame Vigour, reſtore the Conduits or Pipes to their natural Station and Poſition, and conſequently the Bone grows ſtrait again. Sometimes theſe incurvated Bones will not come to their natural Straitneſs till the Eleventh or Twelfth Year of Age.

'Twas requiſite that the Spine ſhould be light, firm, and yet pliable; that ſo it might ſerve as a *Baſis* to the Head, and the chief Support of the reſt of the Body. It was requiſite it ſhould be light, that it might be moved with Eaſe. It was to be pliable, to qualify it for the different Motions of the Body. There are Two Things which render it firm and ſtable:

(1.) The Enlargement of the Ribs of each of its Piece, gives it an Aptitude to reſt very cloſe upon one another.

(2.) The ſubtil and glutinous Subſtance of the Cartilages which conjoin the *Vertebræ* does keep them ſo cloſely united together, that this whole Pyramid ſeems to be but one entire Bone; ſo that all that keeps the Spine firm, is no more than a ſmall Portion of a hard and ſolid Subſtance; for they are covered over only with a very thin Lemel, they being ſpongeous within, which is the Reaſon alſo that they are not very ſubject to Fractures. That which renders it pliable, is the Compoſition of ſo many Pieces, which afford it Liberty to bend on all Sides.

CHAP. VII.

Of the Motion of the Spine.

THE Motion of the Spine is performed by different Ways. 'Tis in Reference to the Diverſity of theſe Motions, that its Pieces of which it conſiſts are diſpoſed and tied together in a moſt ſurprizing Manner.

We will firſt of all ſee how it bends forwards.

The *Vertebræ* are conjoined with one another by the Means of a Cartilage, or rather of a cartilaginous Ligament, being of that Kind which we told you have a Spring, and which you may obſerve in the Cavity of the Haunch, or in the Articulation of the *Tibia* with the Thigh Bone.

Theſe Cartilages enable the Spine to bend forward; for which Reaſon it is, that they are very thick in thoſe Places where the Spine is moved oftneſt, as in the Loins and the Neck.

Their Figure ſeems alſo to be very much adapted to the Uſes they are deſigned for; for they are much thicker before than behind, becauſe the Spine is moved more often that Way. There are ſeveral Things that contribute towards the bending of the Spine forwards, to wit, its natural Incurvation, the Weight of the Head; and theſe Two Things alone are ſufficient to procure it: But beſides theſe, the Muſcles of the lower Venter muſt be conſidered as the Antagoniſts of the Muſcles of the Spine; for they ſerve inſtead of Supporters to thoſe Muſcles, to make the *Vertebræ* of the Loins to bend forwards; for the *Vertebræ* of the Neck are provided with their particular Muſcles, which promote their bending forwards. 'Tis obſervable, that in this Situation of the Spine, the ſpinous *Apophyſes* may eaſier be broken by ſome Blow, and the Body of the *Vertebræ* may alſo be ſooner diſlocated.

When the Spine is put into this Situation, it is reimplaced into its natural Poſition by Means of the *Muſculi Vertebrales*, and by the Elaſticity or Spring of the Ligaments, which having been put into a Situation contrary to their natural Inclination, are of themſelves diſpoſed to reinſtate themſelves into their right Poſition. Theſe are the ſame that conjoin the Bodies of the *Vertebræ*, and the others being alſo too much extended, do alſo endeavour their Reſtitution, to wit, thoſe that occupy the Interſtices betwixt the ſpinous *Apophyſes*.

Now let us ſee how the Spine bends backwards.

That

That Interſtice and Diſtance which is betwixt the Spinous *Apophyſes* affords Liberty to the Spine to bend backwards: For which Reaſon it is, that in the Loins theſe Intervals are much larger than in the Back, which being without Motion, their Spines are bent one upon another; and all the *Muſculi Vertebrales* performing their Functions together, do produce this Flexion of the Spine.

Now let us ſee alſo how the Spine bends towards the Right and the Left Side.

This Motion does depend upon the mutual Articulation of the oblique *Apophyſes*. Two Things are remarkable in this Articulation:

Firſt, The Diſpoſition of the Cavities of theſe *Apophyſes*, which are flat on the Neck, and conſequently very proper to ſlip one over another. In the Loins, ſome are hollowed lengthways, others are a little elongated and flat; notwithſtanding which, they have ſufficient Liberty to ſlip one over the other.

Secondly, 'Tis further obſervable, that the Ligaments of theſe Connexions are concealed. Taking this for granted, the Inclination of the Spine to the Right Side is made in the following Manner:

As for Inſtance; All the *Apophyſes* on that Side draw cloſe together, and ſlip a little one over the other, till ſuch Time that thoſe on the oppoſite Side do move aſunder from one another by the Pliableneſs of their Ligaments, and the Muſcles that ſerve for their Motion, and are thoſe that paſs from one tranſverſe *Apophyſis* to an oblique Proceſs, and from an oblique *Apophyſis* to a tranſverſe Proceſs.

The Spinous *Apophyſes* are of a different Length, according as the Animal ſtands in Need of a ſtrong Spine, and ſuch a one as is a little flexible below, the better to bear a Burthen upon the Back, as the Horſes, Mules, and other ſuch-like Animals; or elſe as they ſtand in Need of a Spine that is flexible inwards, as the Dromedaries, which have their Backs incurvated inwards.

In Beaſts of Burthen, the *Apophyſes* are very long and very thick from their Birth, ſo that their whole Connexion makes a Kind of a long extended Body, which is conjoin'd cloſe together, which in this Situation makes much more Reſiſtance, and conſequently is more adapted to bear a Burthen than it could do in any other Poſition.

'Tis further to be obſerved, That theſe *Apophyſes* are very large at their Firſt Beginning, and that they almoſt touch upon one another, and that their Extremities are bent downwards; which is the Reaſon that when the Back is a little bent by the Weight of the Burthen, they do touch and reſt upon one another, which will not ſuffer them to give Way any further, becauſe they then make a kind of a Vault or Arch: For which Reaſon it is, that the Carriers are ſure to chooſe ſuch Horſes for their Carriages as have high Backs. The *Apophyſes* do form a long Ridge as it were, which does not a little encreaſe the Strength of the Muſcles, which are faſten'd to their Extremities.

In thoſe Animals that have deep hollow Backs, theſe *Spinous Apophyſes* are very ſhort, which does facilitate their Incurvation inwards, becauſe the Muſcles and Ligaments, which reach from one Spine to the other, do not ſuffer any conſiderable Elongation upon ſuch-like Occaſions.

The Thickneſs of the Cartilages which conjoin the *Vertebræ* together, and the Pliableneſs of the Ligaments of the *Apophyſes*, which ſerve to encreaſe this Flexion inwards, as alſo the Joints of the Legs and of the Thighs, which are very looſe, do give full Liberty to thoſe Parts to make very acute Angles.

'Tis a great Queſtion among ſome, How it happens that the Spinal Marrow does not ſuffer a Compreſſion in the different Motions of the Spine? To anſwer this Queſtion it is to be obſerved, that the different Pieces that compoſe the Spine being very ſhort, the Flexion of each of them muſt of Neceſſity be but very ſmall; that is as much as to ſay, to what Side ſoever they incline, they do form very large Angles; and conſidering that the Cavity is very large, and proportionable to the Bulk of the Marrow which is contained within it, that ſmall Flexion that is made there is not capable either to hurt, or ſo much as to ſtreighten the Spinal Marrow, which remains always untouched, and at full Liberty in the Middle of its own Channel, notwithſtanding all the Motions that are made by the *Vertebræ*.

Before we proceed to give you an Account of the other Diſtempers of the Bones, we muſt beforehand ſay ſomething here concerning the Signs by which you may diſtinguiſh their good and ill Conſtitutions.

The good Conſtitution of a Bone is in the Colour of its Surface, and in its Conſiſtency. The better to diſtinguiſh their Colours, the Bone may be reduced under Three different Kinds.

The *Firſt* Kind are thoſe Bones which are altogether ſolid, as the Teeth, the ſmall Bones of Hearing: Theſe are exceeding white.

Of the *Second* Sort are thoſe Bones that are very ſpongy, full of Marrow, and interſpers'd with abundance of Veſſels; ſuch are the Ribs, the Clavicles, the Extremities of the great Bones: Theſe are of a darker white, inclining a little to the red; and according as the Lamel that covers the ſpongy Contexture of the Bone is leſs or more thin, and according as it has a greater or leſſer Number of Veſſels paſſing through it, it inclines leſs or more to a red Colour.

Of the *Third* Kind are thoſe Bones that are partly hollow and partly ſolid; as may be obſerved in the Middle of the Thigh-Bone, and the Bone of the Arm, the Colour of which is a Mixture of both.

'Tis alſo to be obſerved, That this Colour does vary according to the different Ages of the Perſons; for the Bones of Infants are much more inclining to a Red than in adult Perſons: The Reaſon is, becauſe the Bones in Infants are interſperſed with a great Number of Veſſels, which are dried up, and diſappear in adult People, becauſe as the oſſeous Fibres grow bigger, they ſtreighten the Veſſels to ſuch a Degree, that being no longer in a Condition to perform their Functions in their Channels, which makes them to diſappear by Degrees.

The Surface of the Bones is naturally ſlick and ſmooth. In moſt of them their hard and ſolid Conſiſtency ſhews their good Conſtitution; and the Sound, if you ſtrike upon them, is either leſs or more clear, according as the Bone which you ſtrike againſt is either leſs or more ſolid.

From what has been ſaid it is manifeſt, that we may judge of the good or ill Conſtitution of the Bones by the different Changes of theſe Three Things, to wit, by the Sight, by the Touch, and by Hearing: As for Inſtance; a hard and ſolid Bone will give a ſtrong Sound.

You may imagine an Alteration in the Bones, when you obſerve them to turn white and more dry, and without that dewy Subſtance upon their Surface, which was intended by Nature for their Humectation. This white Colour does diminiſh by Degrees, and from a perfect white degenerates into a livid Colour at firſt, and at laſt turns quite black.

This Alteration in the Colour does happen likewiſe to all the other ſolid Parts: As for Inſtance; to the Skin. The yellow and black Colour are only ſuperficial, which ſeems to intimate, that they are occaſioned chiefly by the immediate contact of the Air, or elſe by the Impreſſions made by the purulent Matter, or the Application of Medicines. Sometimes the Bones will exfoliate alſo without turning black beforehand.

The Bones may be diſtinguiſh'd by their Surface; if a Bone, the Surface whereof is naturally ſmooth, is unequal and rugged; if a Probe will enter into it, as in the *Caries*, or in a Wormeaten Bone; for this ſhews you, that it has ſuffered an Alteration.

When we ſpeak of the Wounds of the Bones, you cannot underſtand any Thing elſe by it, than an Inciſion made in the Bone, either by ſome ſharp-edged or ſharp-pointed Inſtruments.

We alſo ſometimes ſay, that a Bone has ſuffered a Contuſion, when the Fibres have been diſcompoſed by ſome foreign Body.

CHAP. VIII.

Of the Cliquetis *of the Bones.*

THE *Cliquetis* of the Bones, or that Noiſe we ſometimes hear in the Motion of the Members, is occaſioned by a Dryneſs in the Joints, cauſed by the Loſs of that liquid Subſtance which moiſtens them. Thus it happens ſometimes to thoſe that are afflicted with the *French* Diſeaſe, who do hear a Noiſe in their Knees when they are Walking, which Noiſe is occaſioned by the Colliſion of the Bones with the Lgiments.

This

This Noiſe may be occaſioned alſo by a very ſtrong Extenſion of the Ligaments and the Tendons that incircle the Joint, which ſtriking hard againſt the Air, produce this Noiſe.

The Explanation of the Figures repreſented in this Plate.

Figure I. *ſhews the ſeveral Inſtruments uſed in curing Fractures of the Skull, &c. from* Scultetus.

N° I. A Two-edged Knife, call'd by *Celſus* a *Spatha*, made uſe of for cutting croſs-ways or triangular Wounds in the Head, or making the Operation call'd the *Paracenteſis*.

N° II. A Scraping-Knife, or proper Inſtrument to cut the Skin of the Head quite down to the Bone.

N° III. Part of the Trepan, now call'd the *Crown*, made of the beſt Steel, hollow, with Four Wings, and Teeth like a Saw, which runs round the Mouth of the Wound, and is to be fixed to the Turner.

N° IV, V. Other Sorts of the ſame Inſtrument.

N° VI. The other Part of the Trepan, call'd the *Vertibulum*, or the Turner.

N° VII. An Inſtrument compos'd of a Scraper and a Lenticular on each End.

N° VIII. A Lenticular only.

N° IX. A crooked Silver Plate, to raiſe up the Depreſſion of the Skull in a Fracture.

N° X. An Inſtrument to be applied when the *Dura Mater* is depreſs'd, ſo that the purulent Matter occaſion'd by the Trepan, and collected betwixt the *Cranium* and the Membranes, may be diſcharged.

N° XI. A Leaden Hammer.

Figure II. *ſome other Inſtruments for the ſame Purpoſe as aforeſaid.*

N° I. The Triploid *Terebellum*, or Triple-Gimlet.

N° II. A Crow to raiſe up the depreſſed Bones.

N° III. The Triploid Elevator, from having Three Feet to ſtand upon. *A*, repreſents the *Terebra*, or Screw-Gimlet; *B*, the Handle, or Crow; *C*, the Fixing on of the Gimlet.

N° IV. A Leaver, only uſed in the larger Depreſſions of the Skull.

Figure III. *Of Saws, Scrapers, &c.*

N° I, & II. are Two right Saws, for making ſmooth any jagged Parts.

N° III. A hollow Scraper.

N° IV, V, VI. are hollow Scrapers, but made like a Half-Moon.

N° VII. A ſharp-pointed Scraper.

N° VIII. Altogether plain

N° IX, X. Scrapers for a carious Bone, which a Surgeon ought always to have ready by him.

Figure IV. *The Manner of treating* Fractures *and* Luxations.

A. A Bottle of ſharp Wine.

B. One fill'd with Oil of Roſes.

C, C, C. Three Eggs.

D. The Beating of Whites of Eggs in a Diſh.

E, F. Two Rollers.

G. A Roller with Two Heads.

H. The moiſtening of the Rollers in ſome proper Liquid.

I. A Bandage four times doubled, with the Liquor preſs'd out.

K. Splints even at both Ends.

L. Cords or Binding to tie down the Splints.

N° I. ſhews how *Hippocrates* taught, while the Leg was extended by Two Aſſiſtants, to roll the Bandage towards the Right Hand, *E*, about the affected Part, then to go back again till you have covered a good Part of the Leg, with Four, Five, or more Rounds.

N° II. teaches us how to wind the Second Roller, *F*, which is twice as long as the Firſt, juſt the contrary Way.

N° III. explains the Manner of applying the double Bandage, *I*, lengthways about the Fracture, ſo that betwixt one and the other there may be a Finger's Breadth Diſtance; as you may ſee by the Letters *G, G.*

N° IV. informs us how to apply the Splints after the Fear of the Inflammation is over; and

and how to faſten the Binding or Cordage, as at *L.*

Figure V. *Of raiſing the Depreſſions of the Skull, and other Things neceſſary to be performed in the Fractures of the* Cranium.

N° I. ſhews a Depreſſion of the Skull, when by Reaſon of the Streightneſs of the Crack, you cannot raiſe it with the Crow.

N° II. The *Triploid Elevator.*

N° III, IV, V. ſhew the Uſe of the *Forceps*, with which the little Bones are partly cut aſunder, and partly broke off, ſo that they may not prick the Membranes of the Brain.

N° VI. The Cutting off a ſmall Bone with the *Forceps.*

N° VII. The depreſs'd Skull rais'd by *Paræus*'s *Leaver* or *Elevator.*

N° VIII. If the Chirurgeon hath not the aboveſaid Inſtrument at Hand, he may ſafely break the Bone off with this here deſcribed.

N° IX. The Dividing the Interſtices of the *Foramen* with a little Saw.

N° X. The Interſtice of the *Foramen* being out, you may raiſe the *Cranium* with this Kind of Inſtrument.

FIGURE VI.

N°. I ſhews a Fracture of the *Os Femoris*, extended by Cords, where it cannot be done by the Hands only.

N° II, & III. ſhew the Poſition of the Member, and placing of the Arm or the Foot, ſo far as neceſſary in the Extenſion, Coaptation, Deligation, and Poſture of the Part in a *Fracture* or *Luxation.*

Of Luxations *and* Diſlocations. *Taken out of Monſieur* Le Clerk, *Phyſician in Ordinary to the* French *King, his Treatiſe of the Diſeaſes of the Bones.*

THE Luxations are by ſome miſtaken for ſuch Diſeaſes of the Bones as are to be managed or cured without much Difficulty; but without any ſufficient Reaſon; for he that pretends to manage Diſlocatio as they ought to be done, muſt be well a quainted with the Structure of the affecte Part, without which, he may eaſily miſta a Separation for a Luxation, and a Cont ſion for a Fracture.

There are Three Sorts of oſſeous Part which may be ſeparated in the Bodies of t Animal.

The *Firſt* are thoſe that are ingrained o indentated one over the other, without an Motion, as are the Pieces that compoſe th *Cranium*; but this Separation can happe only in Infants, where the ſmall Teeth o the Sutures are as yet very tender and flexible, as is obſervable in the *Hydrocephalus.*

In adult Perſons, this Diſeaſe may be oc caſioned by ſome Fracture made either ver near the Suture, or made acroſs it: And i is evident both by the Structure and firm Connexion of the Sutures, that this Separation cannot be produced in Adults by any other Cauſe. What has deceived abundanc of People in this Regard is, That a ſlende Quantity of a Seroſity, which is coagulated at the Sutures, enters the *Aponeuroſis* of th *Muſculi Frontales* and *Occipitales*, as alſo th *Pericranium*, and the Skull it ſelf, which produces a Tumour, which by thoſe tha are not fully acquainted with theſe Parts, is miſtaken for a Separation of the Sutures in the violent Pains of the Head.

The *Second* Sort of Luxations are thoſe that happen to thoſe Parts that are united by Means of Cartilages; ſuch as the *Os Pubis*, the Bodies of the *Vertebræ*, *&c.* 'Tis very well known, that in the Luxations of the Foot, the *Perone* and the *Tibia* will ſuffer a Separation, as ſhall be ſhewn hereafter. This Separation is called a *Diaſtaſis* by Authors.

The *Third* Sort is, when the Heads and Prominencies of thoſe Parts that have an Articulation without Motion within certain Cavities are diſlocated; and 'tis of this laſt Kind that we muſt underſtand the Authors, when they ſpeak of the Diſlocations of the Bones.

The Luxations are either *Compleat* or *Incompleat.*

The *Firſt*, or *Compleat Luxation*, is when a Bone is quite ſlip'd out or diſplaced out of its Cavity.

The

The *Second*, or *Incompleat*, is when a Bone, though not quite diſlocated out of its Cavity, is ſlip'd into a Place where it ought not to be: As for Inſtance; when the exterior *Condylus* of the Thigh-Bone does ſlip into the interior Cavity of the Leg.

From whence it is manifeſt, That there are no compleat Luxations but what happen in thoſe Bones that are articulated by an *Arthrodia*, or at leaſt not unleſs they proceed from ſome internal Cauſe; and that all the Incompleat Luxations muſt happen in thoſe Bones that are articulated by a *Ginglymus*; as we ſhall have Occaſion to ſhew hereafter.

Both the *Compleat* and *Incompleat* Luxations may be ſubdivided into *Simple* or *Complicate*; that is to ſay, that the laſt of theſe Two is attended either with a Wound or with a Fracture.

The Cauſes of Luxations are either *internal* or *external*.

The *external* are manifeſt, of which the poor Patient is too ſenſible to his Coſt; for he is ſenſible that he has received a Blow, that he has had a Fall, or has been affected by ſome other external violent Motions.

But the *external* Cauſes are moſt commonly not manifeſt, or at leaſt not till they are diſcovered by the ill Effects they produce; for if a Cavity that is deſigned for the Reception of a certain Head of a Bone, is fill'd up with ſome extraneous Matter, or if the Ligaments that ſerve for the ſtrengthening of an Articulation have ſuffered a Relaxation, it muſt of Neceſſity happen, that the Head is thruſt backwards out of its Place, and conſequently it muſt undergo a Luxation.

Theſe Sorts of Luxations frequently happen to thoſe People that are affected with the *Sciatick Gout*, or with the *Rhumatiſm*, Defluxions, Palſies, and the Scurvey; as likewiſe to thoſe that lie in moiſt and marſhy Grounds. Sometimes this Luxation is alſo the Conſequence of ſome very long Diſtemper.

Sometimes it happens, that the Bone is not quite diſplaced out of its Cavity, and then it is called an *Incompleat Luxation*, or a Relaxation of the Joint: But generally ſpeaking, it ſlips quite out of its Cavity, and ſettles it ſelf near it, and then it muſt be comprehended under a compleat Luxation.

Theſe Diſlocations are very difficult to be reduced, and ſtill more difficult to be cured; for you muſt take Care not only to diſpel the Matter that has fill'd up the Cavity of the Joint, which is very viſcous, glutinous, and ſometimes indurated; but alſo you muſt reſtore to the Ligaments their Elaſticity and natural Tenſion.

Thoſe that are rightly acquainted with and well conſider the Structure of theſe Parts, will eaſily be convinced of the Danger of them: Nevertheleſs, when they are freſh, their Cure muſt be attempted by the following Remedies:

If the Matter is coagulated in the Nature of a Plaiſter, the internal Remedies are the beſt; and among theſe, all ſuch as mortify the coagulated Acid; ſuch are the ſharp volatile Salts, which will prevent ſuch Sorts of Coagulations. All the volatile Remedies drawn from the Tartar are the moſt proper in ſuch-like Caſes.

To diſpel the glutinous Matter, you may with good Succeſs make Uſe of the ſame Remedies that are prepared againſt the *Enchyloſis*; and among others, a Cataplaſm made with Earthworms, *Sal-Armoniac*, and Lime; but take Care you let it be cooled a little before you apply it.

In order to ſtrengthen the Ligaments, you muſt take Care to keep the Part after its Reduction ſteady, by the Means of proper Bandages. You muſt order your Patient univerſal internal Sudorificks, and ſuch Remedies as are appropriated to the Nerves, and ſuch as do abound with oleaginous volatile Salts, ſuch as may be prepared out of the *Saſſafras*, the *Salſaparilla*, the *Sal-Armoniac*: Aromatick Wines and warm Bathings are alſo proficuous in this Caſe.

The Difficulties we meet with in the Cure of the Luxations that owe their Origin to an internal Cauſe, do depend on ſeveral Things.

Firſt, The compleat Luxations of the Bones articulated by a *Ginglymus*: Thoſe that are of an old Standing and complicated are the moſt difficult of all. 'Tis eaſie to conceive, that a Bone which is quite put out of its Place or Cavity, is more hard to be reduced than one that is not above half out.

After a Bone has remained a conſiderable Time

Time out of its Cavity, this Cavity is fill'd with a gelatinous Matter, which coagulating there, hinders the Bone from re-entring into its natural Poſition or Place. Add to this, that after the Tendons have been for a conſiderable Time detained in the ſame Situation, they are apt to be indurated to ſuch a Degree, as not to be able afterwards to be ſubſervient to the Extenſion of the Part; and the Ligaments alſo which have ſuffered a Relaxation, will acquire a Diſpoſition of maintaining themſelves in the ſame Condition.

'Tis eaſie to be imagined, that there is much more Difficulty in making that Extenſion which is requiſite for the Reduction of the Luxation, when there is a Fracture and a Wound, than when there is no ſuch Thing; eſpecially if the Fracture happens to be near the Joint: In ſuch a Caſe as this you muſt endeavour the Reduction of the diſlocated Bone before you go about the Cure of the Fracture.

Secondly, The Luxations attended with great Inflammations, Tumours, *Echymoſes*, *&c.* are ſtill more difficult to be managed; and oftentimes theſe Symptoms are ſo urgent, that you are obliged to appeaſe or abate their Violence before you attempt the Reduction.

There are, beſides theſe, ſeveral other Things which contribute towards rendring the Reduction of the Bones into their Cavities exceeding difficult.

The principal among theſe may be reduced under Three Heads, to wit, the Structure of the Joint, the Contexture and Conſiſtence of the Ligaments, and the Strength and Number of the Muſcles that ſurround the Joint.

To give you a right *Idea* of the Nature of theſe Difficulties, and in which they conſiſt, I will repreſent them to you in ſuch a Manner, as to have a peculiar Regard to theſe Three Things in each Luxation; from whence it will be evident, not only why ſome Bones are more apt and inclinable to Luxations than others, but alſo, why one and the ſame Bone will ſuffer a Luxation rather, and with more Facility, on one Side than the other; as alſo will ſhew you what Figure the Part will be of after it is diſlocated.

In Reference to the Structure of the Joint in general, the Articulations made by *Ginglymus*, as they do not eaſily ſuffer a Luxation, ſo on the other Hand they are more hard to be reduced than thoſe articulated by an *Arthrodia*; and among these Two, whether by *Arthrodia* or *Ginglymus*, thoſe which have flat and ſuperficial Prominencies and Cavities are moſt ſubject to Luxations; but at the ſame Time are the eaſieſt to be reduced; as, among others, may be obſerved in the Luxations of the *Humerus*, and of the Fingers.

Hence it is evident alſo, That the Luxations made by *Arthrodia*, or the *Exarthroſes*, are altogether *compleat*; and that thoſe that are articulated by *Ginglymus* may be either *compleat* or *incompleat*.

In Reſpect to the Ligaments, the more there are of theſe in a Joint, and the more firm and compact their Contexture is, the leſs they are ſubject to Luxations; but at the ſame Time the more Difficulty you will meet with in their Reduction; as may be ſeen in the Articulation of the Leg with the Thigh-Bone, and in that of the *Cubitus* with the Arm.

In Reſpect to the Muſcles, the more they are in Number, the ſtronger and more forcible they are in their Actions, as in the Thigh and Arm, and the more difficult the Reduction of the Luxation will prove, becauſe they reſiſt very ſtrongly the Extenſion that muſt of Neceſſity be made in the Part that is diſlocated.

Now let us take a View of ſome Inſtances of the different Sorts of Luxations in each Kind of the Articulations; and we will begin with thoſe of the Arm, the Articulation of which is one of the chief *Arthrodia's* that are in the humane Body.

Firſt, it cannot ſuffer a Luxation on its ſuperior Part without a Fracture of the *Apophyſes*, the *Acromion*, and the *Coracoides*; ſo that here there are only Three Sorts of Luxations, to wit, below, backwards, and forwards. Among theſe Three, that which is eaſieſt made, and happens moſt frequently, is that below, as is manifeſt from the Structure of the Joint, and from the Diſpoſition of the Muſcles.

On the fore-Part the Belly of the *Muſculus Biceps*, which comes from the *Apophyſes*

Coracoides, and is ſtrengthen'd by the *Coracobrachialis*, oppoſes it; and the back Part, the Firſt of the *Extenſores Cubiti*, call'd the *Longus*: But there is nothing that makes any Reſiſtance below. On the contrary, the continual Efforts of the *Muſculus Deltoides* do puſh back the Head of the Arm.

The Signs of this Kind of Luxation are:

Firſt, The Muſcles that are on the oppoſite Side where the Luxation is, to wit, the *Deltoides*, the *Coracobrachialis*, and the *Infraſpinatus*, are beat more than ordinary inwards: Whence it is, that the interior Extremities of the Arm jet out towards the Side that is oppoſite to the Luxation; ſo that the Cubit muſt be raiſed upwards.

Secondly, The Muſcles that are moſt relaxed, are the *Major Rotundus* and the *Major Dorſalis*.

Thirdly, The Muſcles that are moſt depreſſed, are the *Dentatus Major* and the *Infraſcapularis*.

Fourthly, The Blood-Veſſels and the Nerves do ſuffer a Compreſſion, which cauſes an *Echimoſis*, and Swelling of the Part.

Fifthly, The Patient feels a Pain at the Originations of the *Muſculi Deltoides* and *Coracobrachiales*, and under the Armpits.

Sixthly, The *Apophyſes*, the *Acromion*, and the *Coracoides*, appear to be pointed.

Seventhly, The Joint appears to be flat.

Eighthly, Becauſe the Arm is fallen into the Cavity of the Armpits, there muſt appear a Tumour there.

Ninthly, The Arm on that Side is longer than that on the other Side.

In the Luxation which is made forwards, the Head of the Bone of the Arm does ſlip into a vacant Place under the *Muſculus Pectoralis*, which is full of Glands and Fat.

In this Luxation the Muſcles that are moſt tenſe are thoſe that draw the Arm backwards, and the moſt relaxed, the *Major Pectoralis*: Whence it follows, that the Extremity of the Arm is drawn backwards.

Secondly, The *Biceps* is extended by the Head of the Bone, which thruſts it forwards; which is the Reaſon that the *Cubit* is a little bent.

Thirdly, The *Muſculus Pectoralis Minor*, the Veſſels, and Nerves, ſuffer a Compreſſion, which occaſions a Tumour and Pain on that Part of the Shoulder.

Fourthly, In this, as well as all the others, the *Apophyſes*, the *Acromion*, and the *Coracoides*, are pointed; the Joint appears hollow; there is a Tumour on that Part where the Luxation is, as well as on the Side of the *Pap*.

In the Luxation which is made backward, the Head of the Bone of the Arm is placed under the Shoulder, underneath its Spine. The Figure of the Part is ſuch, that the inferior Extremity of the Arm does advance upon the fore Part of the Breaſt, becauſe the Muſcles that draw the Arm forward, to wit, the *Major Pectoralis* and the *Coracobrachialis*, are moſt bent.

Secondly, The Cubit remains extended, becauſe its *Extenſor* is thruſt backwards by the Head of the Bone.

Thirdly, The Muſcles that appear moſt relaxed, are thoſe that draw the Arm down and backwards.

Fourthly, There is a Hollowneſs in the Joint, a Tumour under the Spine of the Shoulder, and a Pain on the anterior and ſuperior Part of the Breaſt.

Now let us enter upon an Examination alſo of the Luxations of the Thigh-Bone with the Hip-Bones.

Suppoſing the Cavity of the Hip-Bone to be divided in its Middle by a vertical Section, and then we may ſee, that that half Part which is neareſt to the Leg is deeper, and its Edges are higher; but that the other is ſuperficial only, and has a Furrow: Hence it is evident, that when the Head of the Bone is forced to quit its natural Station, it will rather fall on that Side than towards the other, whether it be forced above or below: And it is evident alſo, that the Luxations below are more common, by Reaſon of the Furrow which is in that Part of the Cavity.

We muſt very well obſerve the Situation as well as the Nature of the Ligament, which does hold the Head of the Thigh-Bone into the Cavity of the *Os Iſhium*, for it is of a cartilaginous Nature, and it has a Spring, which naturally requires to be ſhorten'd.

'Tis apparent from thence, that the Thigh-Bone cannot abandon its Place, unleſs when this Spring is entended beyond its natural Inclination, or elſe when it is broken aſunder.

It may be ſtretch'd out by ſome very violent Effort or Motion, or it may be weakened by ſome Foreign Humour, as it happens in moſt of the Luxations that proceed from internal Cauſes. I ſay, in moſt, becauſe the Cavity may be filled with ſome extraneous Matter that is very viſcous and thick, and by thruſting the Head of the Bone back, extend it beyond its natural Poſition. We may alſo ſee by this, that thoſe Luxations where the Ligament has the greateſt Share, are the ſame that are backwards, it being one of the Cauſes that produces them, and that in the Luxations below it has the leaſt Share.

Taking this for granted, I ſay, that the Luxation of the Thigh Bone may be made either forwards or backwards, and that as well above as below.

We have given you the Reaſon before, why among the Luxations that are made forward, thoſe below are moſt frequent; and we are going to ſhew you why thoſe that are made backwards don't happen ſo often.

(1.) The Head deſcends under the oval Hole; whence it is that the Leg is longer on that Side than on the other.

(2.) The Muſcles that are moſt extended are the *Quadrigemini*; hence it is that the Thigh is drawn upwards, that it ſtands at a Diſtance from the other, and that the Knee and the Feet turn outwards, but the Heels inwards.

(3.) The Muſcles that are moſt preſſing are the *Obturatores*, and the moſt relaxed the *Triceps* and the *Pectineus*.

(4.) The large Veſſels which paſs into the interior Part of the Thigh ſuffer a Compreſſion, which cauſes an *Oedematuous* Tumor and other Swellings in the Parts below it.

(5.) You may perceive a Tumor on the Side of the Manly Bag, and a Depreſſion on the Part of the Cavity where the Luxation is.

(6.) The Leg is flat.

(7.) You feel a Pain in the Leg.

In thoſe Luxations that are made above you can't bend the Thigh forwards, the Head of the Bone does bear upon the *Pubes*, that Thigh which is diſlocated ſtands at a Diſtance from the other, the Knee and the Feet are turned outwards, becauſe the *Muſculi Tibiales* and the *Quadrigemini* are very tenſe; the Leg on that Side is ſhorter than on the other, the Head of the Bone preſſes upon the large Veſſels, and upon the ſpermatick Veſſels, which produces œdematous Tumors and Swelling of the *Scrotum* and of the Teſticles; there is a Depreſſion in the Joint, a Tumour above the Knee, and the Leg is ſomewhat ſhrunk, the Patient feels a Pain at the Knee and the Leg, he can't bend the Thigh, nor put his Feet upon the Ground, unleſs it be upon his Toes.

As for the Luxation backwards; in that which is made below, the Bone bares towards the lower Part of the Feſſe, towards the Sinuoſity of the *Os Iſchium*; the Leg is on that Side a little longer, or very near of the ſame Length with the other: The Muſcles that are extended are the *Triceps* and the *Pectinaus*, which is the Reaſon why the Thigh draws near unto the other, the Knee and the Feet do turn inwards, and the Heels outwards. The Muſcles that draw the Thigh outwards, are moſt relaxed, the Sciatick Nerve ſuffers a Compreſſion, which occaſions a Swelling. There is a Tumour on the lower Part of the Leg, a Depreſſion upon the Place of the Cavity of the *Iſchium*, the Leg is ſhrunk, and as it were thruſt upwards; and the Patient can't extend his Thigh.

In the Luxation above of the ſame Side, the Head does paſs over the higheſt and largeſt Part of the Cavity; that is as much as to ſay,

The Leg on that Side is ſomething ſhorter than the other, which is the Reaſon that the Patient can't ſet his Heel to the Ground, but only his Toes; the Knee and the Foot do turn a little more inwards, and the Patient can't bend his Thigh.

There is a Tumour on that Part where the Head of the Bone does paſs, and a Depreſſion upon the Joint. 'Tis very well worth our Obſervation, that the Authors have given to each of theſe four Kinds of Luxations their peculiar Names.

They have called the *Firſt* Sort of Luxation, which is made forward and below, the *Internal*.

The *Second* Sort, which is made forwards and above, they have called the Anterior Luxation.

Unto

Unto the *Third*, which is made backwards and below, they have given the Name of the External Luxation; and unto the *Fourth*, which is made backwards and above, the Poſterior Luxation.

But theſe Denominations being ſuch as don't very well explain the Nature of theſe different Species of the Luxations, we did not think fit to make uſe of them here.

'Tis now Time we ſhould proceed alſo to the Luxations of the Bones that are articulated by a *Ginglymus*; but before we enter upon an Examination of them, it will be requiſite to put you in Mind, that the Luxations of the *Ginglymus* are either *Compleat*, or *Incompleat*; as alſo, concerning the Structure of the *Ginglymus*, and how many different Kinds there are of them.

Let us begin with the Articulation of the Cubit with the Arm and its Ligaments.

The *Cubit* may ſuffer a Luxation in Four different Ways, to wit, forward, backward, and on both Sides, to wit, inward and outward: The Two firſt are always compleat Luxations, and the Two others incompleat; but the *Incompleat* are thoſe that happen more frequently than the others.

The Cubit undergoes a Luxation forward, when by a very violent Flexion the *Olecranon* ſlips within the anterior Part of the Arm.

The Cubit ſuffers a Luxation backwards, when, by a violent Extenſion, the exterior Prominency of the Cubit does ſlip into the poſterior Cavity of the Arm. In this Luxation the Cubit is forced to remain extended, and the *Muſculi Flexores* are more bent.

The Luxations of the Cubit that are made ſideways inward, are either *Compleat* or *Incompleat*: We will begin with the *Incompleat*, becauſe theſe are more frequent than the others.

The incompleat Luxation of the *Cubit* called the Internal, becauſe the ſuperior Extremity of the Cubit does ſlip towards the interior *Condylus* of the Arm, is diſcovered by a Tumour that ſtretches to the interior *Condylus*. One of theſe ſlips under the *Condylus externus* of the Arm, and the inferior Extremities of the Cubit and the Wriſt are thruſt outwards for the ſame Reaſon as has been mentioned before, to wit, that tho' there is no Muſcle that is oppoſite to this Luxation, nevertheleſs the *Flexores* and *Extenſores* being now in an oblique Direction, endeavour to put themſelves in a ſtrait Line, which they do with the moſt Facility by turning the Part on that Side.

That incompleat Luxation of the *Cubit* which is called the External, is directly contrary to the preceding.

The compleat Luxations of the Cubit ſideways, either inward or outward, do happen when the Cubit is entirely thruſt out of the Joint on one or other of theſe Sides.

The inward Luxation happens very ſeldom, and at the moſt can be no more than an incompleat one, becauſe the interior *Condylus* of the Arm ſends forth a conſiderable Production, which keeps the *Cubitus* and the *Radius* in its Poſition.

But whether this compleat Luxation is made inward or outward, the Cubit or Elbow is always extended in a ſtrait Line. The ſuperior Part is thruſt very often over the fore Part of the Arm, or over the poſterior, but very ſeldom over the Side, which is the Reaſon that theſe Luxations are often miſtaken for one of thoſe that are made forward or backward.

To diſtinguiſh this Luxation from that which is made forward, it muſt be remembered, that the Cubit is bent in the anterior Luxation, whereas in this it is extended like in that which is made backwards.

And to diſtinguiſh it from this laſt, it is to be obſerved, Firſt, that in the poſterior Luxation the Tendons of the *Muſculi Flexores* do paſs over the Joint, and that you may feel them with your Finger upon the anterior Cavity of the Arm, which is not found in the ſame Manner in this. Secondly, in the poſterior Luxation the Cubit does not riſe up ſo high as in this, the Points of the Inſertion of the *Flexores* ſtand in the Way.

Of the Luxation of the Wriſt.

THE Wriſt may ſuffer a Luxation by Two different Ways, to wit, either according to its Flexion or its Extenſion, or according to its Abduction or Deduction.

The Luxation according to its Flexion is, when it is luxated inwards, then the Hand turns inwards, there is a Tumour on the Side of the Palm of the Hand, and if the Luxation happens according to the Extenſion

which is called the Extention outwards, then you may obſerve the contrary.

The Luxation towards the Sides, or according to the Abduction, when the Wriſt is almoſt thruſt to the Side of the *Radius*, then there is a Tumour on that Side, and a Depreſſion on the other, and the Hand hangs towards the Side of the Cubit.

The Two laſt of theſe Luxations are incompleat, by Reaſon of the *Apophyſes* of the *Cubitus* and of the *Radius*, as ſhall be ſhewn hereafter.

The Fingers will ſuffer a Luxation, and admit of an eaſy Reduction alſo, becauſe their Joints are very hollow, and their Ligaments looſe, but have nothing elſe that is remarkable.

Of the Luxations of the Leg.

IT is very ſeldom that there happens a Luxation in this Part; not only by Reaſon of the Structure of the Joint of the Leg, which is ſecured by a Cartilage in the Shape of a Croſs but alſo of its Ligiments which are on the inſide, and being provided with a Spring, add to its Strength and Security.

The Leg ſuffers a Diſlocation Four different Ways, to wit, forward, backward, and ſideways, to wit, inward and outward: The Two firſt are *Compleat*, and the Two others *Incompleat*.

In the Luxation that is made forward, the Leg is ſhorter than the other, and is ſtretch'd backwards, tho' it is bent, and the Heel turns towards the Leg.

In the inward Luxation, the Leg and the Foot are thruſt outwards.

There is a Cavity on the outſide, and a Tumour on the inſide; ſo that the interior *Condylus* of the Thigh Bone does reſt upon the exterior Cavity of the Leg. The contrary is obſervable when the Luxation is outward.

Of the Luxation of the Kneepan.

THere being ſo cloſe a Coherency betwixt the *Rotula* or Kneepan with the *Aponeroſis* of the *Muſculi Extenſores* of the Leg, this, together with the Diſpoſition it has of riſing upwards and deſcending again, ſeems to intimate, that it can't ſuffer a Luxation either upwards or downwards, but only ſideways, and eſpecially inwards. Theſe Two Sorts of Luxations are ſoon diſtinguiſhed, for there is always a Depreſſion in the Place, which is the natural Station of the *Rotula*, and a Tumour on that Side unto which it is thruſt in the Luxation.

Of the Luxation of the Foot properly ſo called.

THE Foot properly ſo called may undergo a Luxation by Four different Ways; to wit, forward, backward, inward, and outward; the Two firſt are compleat Luxations, and the Two others incompleat, or at leaſt when the Muſcles that retain the Bones are torn aſunder, as alſo the *Malleolus Externus*.

The *Aſtralagus* may ſuffer a Luxation forwards, and then the *Os Calcis* occupies the Cavity of the *Tibia*; and then the Heel has no firm Hold, and the Foot is bent, notwithſtanding the Tendon of *Achilles* is very ſtrongly bent.

When the *Aſtralagus* has ſuffered a Luxation backwards, the *Os Naviculare* does paſs under the Joint, and the *Tibia* underneath; which is the Reaſon that the Heel is very long, and the Foot ſhort, and remains in a State of Extenſion.

Among all the incompleat Luxations, that which is made outwards is the moſt uncommon, becauſe the *Perone* does deſcend lower, and embraces the *Aſtralagus*. Whenever this Luxation happens, the Sole of the Foot turns inward, becauſe the Muſcles that are deſigned for this Motion are at a greater Diſtance from their Reſting-Place. The contrary happens when the Luxation is inward.

In the incompleat Luxations, there is almoſt always a Separation of the *Tibia* and the *Perone*, as in thoſe of the Wriſt there is a Separation betwixt the *Radius* and the *Cubitus*. This is the Reaſon why, after the Luxations of the Foot and the Wriſt, 'tis a great while before we are able to uſe them, and that we are ſenſible of a great deal of Pain. Theſe Separations being very hard, and requiring a conſiderable Time to be reſtored to their natural State:

'Tis to be obſerved, that tho' we have called this a Separation, as well in the Wriſt as

as in the Foot, it is nevertheleſs a true Luxation; becauſe the *Cubitus* and the *Radius* are actually articulated with the Wriſt; but in the Foot it is no more than a Separation, the *Tibia* and the *Perone* being ſo cloſely conjoined by the Means of Cartilages and Ligaments, that they may very properly be ſaid to be united.

'Tis further obſervable, that, generally ſpeaking, in all the incompleat Luxations, of what Kind ſoever they be, the Ligament that is on the Side of the Luxation, *i. e.* on that Side where the Bone is thruſt out, does ſuffer more than that on the other Side.

Beſides theſe *Species* of the Luxations of the Wriſt and of the Foot, there are others alſo which have a Relation to the ſmall Bones in particular which compoſe the Wriſt or the Foot.

Theſe Luxations happen when ſome of theſe ſmall Bones are ſlipt out of their Places, and ſometimes are thruſt outwards, and ſometimes inwards. Theſe Luxations will ſoon diſcover themſelves by a Tumour, which is made by the diſlocated Bone on that Side where it is thruſt out.

It happens alſo ſometimes, that in the violent Motions of the Joints a Head will ſlip out only half Way, and then ſlip in again; a Thing that frequently happens in the Foot.

Of the Luxation of the Jaw.

IT is eaſy to be diſcovered by the Cavity of the Temple Bones, that the Jaw may much eaſier ſuffer a Luxation forward than backward, that Side being much more elevated; and there may happen a Luxation in the Jaw, either at both Sides at once, or only at one.

The Luxation which happens on both Sides, otherwiſe called the compleat Luxation, may happen by Four different Ways:

(1.) *Forward*; the Two *Condyli* of the Jaw bear upon the Roots of the Zygomatick Proceſſes, and on both Sides, towards the fore Part of the Ears, there is a Depreſſion which is the Cavity of the Temple Bones. The Chin does ſtick outwards, and hangs upon the Breaſt, the Mouth is open, and the Patient is not able to ſhut it; notwithſtanding that the *Muſculi Crotaphites* and *Maſſeters* are very much extended. The Patient is troubled with exceſſive Pains in the Temples, by Reaſon of the Tenſion of the *Crotaphites*, and the Compreſſion of their Tendons, which are placed betwixt the *Apophyſes Choracoides* of the lower Mandible and the *Zygoma*. He is affected with an involuntary Emiſſion of the *Saliva*, and can't ſpeak. The *Muſculi Pterigoides* are very much preſſed. It is this Luxation that happens ſometimes in Yawning.

(2.) *Backwards*, and then the Two *Condyli* of the Jaw do bear upon the bony and cartilaginous Conduit of the Ear, and upon the Roots of the *Apophyſes Styloides*; but this Sort of Luxation does not eaſily happen in adult Perſons, or at leaſt not unleſs the *Apophyſes Styloides* are fractured. In Children it may be done with leſs Difficulty, for the Conduit of the Ear is only cartilaginous.

In this Kind of Luxation there appear Swellings all along the Ears, near the *Apophyſes Maſtoides*; the inferior Mandible is ſhorter than the ſuperior, the *Dentes Inciſores* ſtand behind thoſe that are above them; the Mouth is ſhut, and the Patient is a little inclined to Deafneſs.

The *Third* and *Fourth* Kind of Luxation happens when one Side bears inwards, whilſt the other is thruſt outwards; as for Inſtance, if the right *Condylus* advance toward the Conduit of the Ear that has a Communication with the Mouth, and the left Conduit bears upon the Conduit of the Ear: This produces a Tumour on the left Side, and a Depreſſion on the right, the Patient is deaf with the Left Ear, the Chin ſtands athwart to the left Side; the contrary does happen if the left *Condylus* bears upon the Conduit of Communication betwixt the Ear and the Mouth; and the right bears upon the Ear, which produces a Tumour on the left Side. The contrary happens if the left *Condylus* bears upon the Conduit of Communication of the Ear.

The incompleat Luxations of the Jaw, to wit, thoſe that happen on one of its Sides, are made Two different Ways, to wit, forward and backward. Thoſe that are made forward are the moſt frequent of the Two. In both theſe the Mouth ſtands awry; ſo that if the right *Condylus* is luxated forward, the

the Chin is thruſt outwards towards the left Side, and you may obſerve a Depreſſion towards the Cavity of the right Temple Bone. The contrary happens if the left Side has ſuffered a Luxation.

If the right Side is diſlocated backwards, the Chin is drawn inwards, towards the right Side, and there is a Tumour near the right *Apophyſis Maſtoides*. The contrary happens if is the left.

In the firſt Kind, to wit, in that which is made forward, the Mouth is more open, eſpecially on that Side where the Luxation is, than in the Second *Species* where it is more cloſe, eſpecially on the Side where the Luxation happens.

Thus we have ſhewn you the Differences, Cauſes, and Signs of the Luxations, together with the Difficulties we labour under in their Reduction; what remains now, is to give you an Account alſo of thoſe of the *Vertebræ*, the Ribs, and the *Claviculæ*.

And upon this Occaſion of the *Vertebræ*, we will ſay ſomething alſo of the crooked Backs, of their Nature, Cauſes, and Formation; but not till after we have given you a general Idea of the Structure of that Column which is known by the Name of the Spine.

Of the Incurvation of the Spine.

WHen all the Muſcles and Ligaments of the back Part of the Spine are weakned, the Spine does incurvate like an Arch, and bends forward much in the ſame Manner as it is bent naturally that Way; as it happens in very aged Perſons, in thoſe that have received ſome very violent Blows, or have had a Fall upon that Part of the Spine.

The ſame Thing may happen alſo by ſome violent Efforts. By Convulſions, Defluxions, and by Rheumatiſms that happen to fall upon that Part, or elſe by keeping the Body in a certain Situation, ſuch as is required in certain Employments, or becauſe a Man is obliged to keep his Bed for a very conſiderable Time, or elſe by ſome long Diſtemper, or elſe by lying a great while upon the Back upon the Ground, or in moiſt and marſhy Places.

All theſe before-mentioned Things being apt to weaken the Muſcles and the Ligaments of the poſterior Part of the Spine, the Head and the Breaſt, by their natural Propenſity, do fall forward, the Effort of the Ligaments which tie the Bodies of the *Vertebræ* together do alſo contribute to it; for being not counterballanced by the Action of thoſe that faſten the Pieces backwards, nor by the Muſcles, they ſhorten themſelves, and cloſe the *Vertebræ* together on their fore Parts.

In theſe Kinds of Incurvation it is to be obſerved, *Firſt*, that the anterior Part of the Cartilages, which is betwixt the Bodies of the *Vertebræ*, being cloſed together, they become dry and meagre; whilſt the poſterior Part of the ſame Cartilage, which is not ſo cloſe and ſqueezed together, does encreaſe and maintain it ſelf in its natural Poſition, and turns bony.

Secondly, that the ſpinous *Apophyſes* do open and remove one from another, and that a glutinous Matter is gathered betwixt the oblique Proceſſes, which alſo ſtand a good Diſtance from the other.

'Tis eaſy to conceive, that when upon occaſion of a Blow or a Fall the Ligaments are bruiſed, this makes a glutinous Matter to gather in a great Quantity betwixt the Joints of the oblique *Apophyſes*, juſt as it happens in all the other Joints of the Body.

Thoſe that are thus round or crooked-back'd are called *Silicerni*, becauſe they always have their Eyes fixed towards the Ground.

The contrary happens in caſe the Ligaments of the anterior Part are weaken'd, either by Defluxions or by a Rheumatiſm; for in this Caſe the Strength of the Muſcles and Ligaments of the poſterior Part of the Spine, being not counterballanced by that of the Ligaments of the anterior Part, they ſuffer the Spine to incurvate backwards. The poſterior Part of the Cartilages, which are placed betwixt the Bodies of the *Vertebræ*, being ſqueezed together, grow dry and meagre, whilſt their anterior Part, which is at its full Liberty, is nouriſhed as it uſed to be, encreaſes in Bulk, and keeps up its natural Station and Thickneſs.

'Tis to be obſerved, that if one of the lower *Vertebræ* is luxated; as for Inſtance, the firſt *Vertebra* of the Back all the inferior Parts which do receive the Nerves from the

the Spinal Marrow that is below it, turn paralitick; and notwithſtanding the Patient does not loſe his Stomach, he will infallibly die not long after: But when the Firſt *Vertebra* of the Neck ſuffers a Luxation, the Party dies in an Inſtant upon the Spot.

'Tis further to be obſerved, that when the Spinal Marrow is put out of its Place, ſo as to rub againſt the Sides of the Cavity of the *Vertebræ*, whereby the free Paſſage of the Spirits is interrupted, the ſame Symptoms will enſue.

In theſe Caſes, the oblique and ſpinous Proceſſes do ſtick cloſe one upon another: In the Spine there is a Depreſſion, the Belly and Breaſt ſtand out forward. Thoſe that are afflicted with the Firſt Kind of Incurvation can ſcarce dreſs themſelves, or at leaſt not without Pain; and in the other they cannot eaſily bend forwards.

All theſe Symptoms may happen to Children, either before or after the Birth, barely by the unequal Diſtribution of the Nouriſhment of the ſeveral Parts of the Spine, occaſioned by ſome vitious Diſpoſition of the Cartilages, or of the *Vertebræ*; for it happens in the *Vertebræ* as we told you before of the Cartilages: Their Indiſpoſition forces the nutritious Juice to flow in a greater Quantity: As for Inſtance; into the anterior Part of the Cartilages, or of the *Vertebræ*, than in the poſterior; and thus not only the Cartilages, but alſo the Bodies of the *Vertebræ*, grow thinner before, than behind.

In the Caſe we are ſpeaking of, all the ſeveral Pieces of the Spine do contribute towards its Incurvation.

Now let us ſee how the Caſe ſtands when ſome of theſe particular Parts are but out of their Frame. We will begin with the *Vertebræ* of the Loins.

When the *Vertebræ* of the Loins alone bend forward, thoſe of the Back remain in their natural Situation, but ſtand out a little backwards, which produces in that Part a Convexity, which is called a Gibboſity.

In this Caſe, the anterior Part of the Cartilages which is betwixt the Bodies of the *Vertebræ* becomes very thin, and the poſterior very thick; the oblique and ſpinous Proceſſes open, and ſtand aſunder one from the other: And as the middlemoſt *Vertebra* is thruſt outwards more than the reſt, 'tis this that makes the Point of the Gibboſity, which oftentimes repreſents the Figure of a Sugar-Loaf.

This Point is leſs or more obtuſe, according as there are more or leſs of the *Vertebræ* that form it.

Theſe People are crook'd-back'd only behind; but if this Gibboſity is occaſioned by the Diſcompoſure of the *Vertebræ* of the Back, they are crooked both behind and before at the ſame Time. The Gibboſity that is on the fore Part, is always oppoſite to that which is on the Back in its Situation: I mean, that if the latter of theſe Two is on the upper Part, that before is on the lower Part. Let us ſee in what Manner it happens.

If this Gibboſity owes its Origin to an Incurvation of the ſuperior *Vertebræ* of the Back, which are thruſt outwards, thoſe below do remain in their natural Situation. The Ribs, which are articulated with the *Vertebræ* that are put out of Frame, muſt of Neceſſity follow them, and ſo they are thruſt backwards, which of Neceſſity flattens, and cauſes a Depreſſion on the ſuperior and anterior Part of the Breaſt; whilſt the inferior *Vertebræ* of the Back, which remain in their Poſition, do alſo keep the Ribs, wherewith they are articulated in their natural Situation: Whence it is, that the lower Part of the Breaſt retaining its Convexity, ſeems a little raiſed; and this is the Gibboſity that is to be obſerved on the forward Part, which is always oppoſite to the other that is backwards, in ſuch a Manner as we have mentioned before.

In caſe this Gibboſity were formed behind by the inferior *Vertebræ* of the Back, the upper Part of the Breaſt would appear crooked, becauſe it would retain its Convexity, whilſt its lower Part would be flat and depreſſed, becauſe the inferior Ribs and the lowermoſt Part of the *Sternum* would be drawn backwards and inwards by the laſt *Vertebræ* of the Back, to which theſe *Vertebræ* are articulated.

In theſe Caſes, all the *Vertebræ* make the Gibboſity ſtand cloſe together before, but their oblique and ſpinous Proceſſes do go aſunder; the anterior Part of the Cartilage is very thin, and the poſterior much thicker. If this Gibboſity happens in the Infancy, or perhaps from the Birth, the Bo-

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dy of the *Vertebræ* is very thin before, and very thick behind.

When this Gibboſity happens on the upper Part of the Back, the Neck is depreſſed, and lies as it were concealed betwixt the Two Shoulders, becauſe the Joints of the Arm ſtand up very high; for the Gibboſity thruſts the Shoulders back both above and below upon the whole inferior Angle of the *Omoplatæ*. Theſe People ſeem to have their Legs and Arms much longer than other Perſons, becauſe the Incurvation of the Spine takes off much of its Length, and conſequently the Arms and Legs ſeem to be longer.

Sometimes one or both Shoulders are crooked, which does not depend on any ill Conformation of the Spine, but on that of the *Omoplatæ*, which are, as for Inſtance, very convex on the Outſide, or on the overgrown Bulk of the Muſcles which cover them.

If the *Vertebræ* of the Back are thruſt inwards, the Back will have a Depreſſion, and the Gibboſity will appear only before.

The *Sternum*, and the Ribs which are articulated to the *Vertebræ* that ſtand inwards, being by Conſequence thruſt forwards, in this Caſe the ſpinous and oblique Proceſſes ſtand cloſe together, the poſterior Part of the Cartilages which are betwixt the Body of theſe *Vertebræ* are very thin, and the anterior very thick. The ſame Thing will happen in the Body of the *Vertebræ*, if it happens before the Party is born, or in his Youth.

Theſe are all the different Sorts of Gibboſities which are occaſioned by an Incurvation either behind or before, either of all the *Vertebræ* of the Spine, or of ſome of its Pieces. 'Tis now Time we ſhould enter alſo upon an Examination of that Incurvation of the Spine which is made ſideways in the Shape of a *Roman* S.

In caſe the Spine ſuffers an Incurvation on one Side only, it produces a Gibboſity on that Side into which the *Vertebræ* are thruſt, and a Drepreſſion on the Side directly oppoſite to the Gibboſity; and the Body will always bend to that Side which is oppoſite to it.

Sometimes the Spine will admit of an Incurvation on both Sides at once, altogether like a *Roman* S, and ſo will make Two Gibboſities, one on each Side, and that in ſuch a Manner, that in caſe the Gibboſity on the Right Side is above, the Gibboſity on the Left Side is below, and there will be a Depreſſion on each Side directly oppoſite to each Gibboſity. The Cartilage which it placed betwixt the Body of the *Vertebræ* does grow bigger on the Side of the Convexity, the *Apophyſes* on that Side ſtand aſunder, and the Cartilage which is preſs'd upon on the Side where the Depreſſion is by the Body of the *Vertebræ*, decreaſes and diſappears inſenſibly, and the oblique *Apophyſes* on that Side are cloſed together.

If this Crookedneſs is found in a Child ſo ſoon as it is born, or in its tender Years, the ſame Thing happens to the *Vertebræ*, as to the Cartilages that are betwixt them. This Contortion of the Spine has Two Cauſes, as well as the other Gibboſities, to wit, the Encreaſe of one Side of the Cartilages in Bulk, and even of the Body of the *Vertebræ* in ſome, where the gelatinous Matter does fill up the Joints on one Side only, which may happen by the ſame Cauſes that have been mentioned before, only that they act upon one Side only of the Spine.

If the Incurvation or Contortion is in the *Vertebræ* of the Back, the Breaſt will ſuffer a Contortion alſo on the Sides, becauſe the Ribs are obliged to follow the Motions of the *Vertebræ* unto which they are articulated; and the Contortion of the Breaſt will always be on that Side where the Incurvation of the Spine is.

If there be an Incurvation on each Side of the Back, the ſame will happen alſo on each Side of the Breaſt; for the *Sternum* will ſuffer a Contortion after the ſame Manner as the Spine does.

In ſome People, beſides the Incurvation of the Spine ſideways, the *Vertebræ* will be thruſt alſo backwards, which produces a Sort of a Gibboſity participating of the Nature of both the others: I mean, they ſtick out both backward and ſideways.

In others the *Vertebræ* are incurvated not only ſideways, but they alſo are contorted a little round upon themſelves. In this Kind of Gibboſity there is one Thing very well worth our Obſervation, to wit, that the oblique *Apophyſes* of the convex Side do cloſe

close together on the concave Side: But as for the Cartilages and the Bodies of the *Vertebræ*, they are in the same Disposition as in the other Gibbosities, *i. e.* they are thickest on the convex Side, and very thin on the concave Side.

Those that are affected with an Incurvation of the Spine sideways, are commonly call'd *Torticoli*, because their Neck stands awry, because the *Vertebræ* of the Neck have been put out of Frame, as well as those of the Back, and of the Loins, and their Head inclines commonly to that Side where the Gibbosity is.

In these also the Joint of the Arm of the same Side is thrust upwards and forward; so that if you look upon them from that Side, they appear as if they had no Neck at all; whereas on the other Side it seems to be very long, and yet they are not *Torticoli*, or wry-neck'd.

In these People also the Leg is very often contorted toward that Side where the Gibbosity is, especially in those who have contracted such-like Indispositions, by carrying too weighty Burthens always upon one Side. The Leg is commonly contorted a little below the Knee, about that Part where the Suture of the *Epiphysis* is with the Body of the Bone, and the superior Part of the Leg stands always inward; so that, in Conjunction with the Thigh, it forms a Bow outwards.

In all these different Figures and Situations of the Spine, the Spinal Marrow does not suffer any Compression, because this Marrow is not placed exactly in the Middle of this Channel; and besides this, what the Channel loses on one Side, it gets on the other; and because the Incurvation of each particular Piece is not very considerable, and consequently the more *Vertebræ* there are that make up this Contortion, the less Danger there is of any Compression in the Spinal Marrow.

Those that have a Gibbosity both before and behind, are nevertheless not troubled with any Difficulty of Respiration, as some have imagined, unless it should happen that this Gibbosity did come all at once, or on a sudden; but such an Accident is very rare. Their Breast, though it has a very ill Conformation, has actually the same Capacity as before; for what it loses in its Length, it gets in Breadth; and if one of its Sides is depressed, the other is enlarged in Proportion, because in all Sorts of Gibbosities, the Ribs do retain their natural Convexity; and those that are on that Side where the Gibbosity is, do remove and go asunder at a Distance, in the same Proportion as those on the other Side draw nearer to one another; so that the Breast of Necessity gains as much on one Side as it loses on the other; and the Lungs, which are very supple and pliable, do without any Difficulty accommodate and adapt themselves to this vitious and unnatural Conformation.

Besides these Sorts of Gibbosities, there are also some others that have no Relation to the Spine, and these are such as only are to be seen before, without the least Signs of any such Things backwards, and without any Depression of the Back within the Breast. This Gibbosity is occasioned by a Flattening or Depression of the bony and cartilaginous Part of the Ribs within the Breast, which makes the *Sternum* to stand a great Way forwards.

This Kind of Gibbosity is very often a fatal Consequence of an ill Conformation of the Child in the Mother's Womb, or of a very hard Labour. Sometimes it is occasioned only by the Neglect or Ignorance of the Midwives, who handle the tender and soft Parts of the Child too roughly; or sometimes also of the Nurses, who, when they give Suck to the Child, are sometimes apt to squeeze the Ribs and the Breast, which being as yet very pliable, take any Figure that is given them.

Such as are troubled with this Kind of Gibbosity do always labour under a Difficulty of Respiration, and seldom live to the Age of Puberty; for their Ribs being flatten'd and depress'd inwards, the Breast loses a considerable Part of its Capacity.

'Tis not an easie Matter to cure crooked People, because this Indisposition is commonly not well discovered, before the Evil is so far gone as to be past Help: I mean, you seldom are able to discover it till it is entirely fixed; for these Sorts of Indispositions seldom appear till such Time that the *Vertebræ* have actually suffered their Contortion, by the Overgrowing of some Part of

their Body, or elſe of the Cartilages that are placed betwixt them; and when this is once done, it is no eaſie Task to reduce it into its natural Frame, and to reſtore to it its ſtreight Figure and Flexibility which it ought to have, but has been loſt ſince.

The beſt Remedies are, Corſlets or Stays of Iron or Whale-bones, eſpecially in the Beginning of theſe Diſtempers; and if they do not accompliſh the Cure, they will at leaſt put a Stop to them, and hinder their Progreſs.

If the Gibboſity be backward, you muſt let the Patient lie as much as poſſibly can be upon his Back, and put a Linen Cloth under that Part upon which the Gibboſity is to bear, and contrive the Matter thus, that both his Head and his Legs may lie very low. If this Contortion is on one Side, you muſt make the Patient incline his Body much more toward that Side than to the other.

Proper Remedies may be applied ſometimes with Succeſs, if managed with Care and Dexterity in the Beginning, and whilſt theſe Diſeaſes are as yet new, eſpecially in young People, provided they are continued for a long Time. At the ſame Time you muſt not neglect the internal Remedies, ſuch as are capable to diſpel the glutinous Humour: But if the Perſons are far advanced in Age, or the Diſeaſe is of an old Standing, there is no Hopes of a Cure; and all that you are able to do is by the Means of Corſlets, to prevent the Encreaſe of this Evil.

As to what relates to Gibboſity, which ariſes from the Depreſſion of the Ribs inwards, if it be not immediately diſcovered, and taken in Hand, it is incurable; for even at its Firſt Beginning, its Cure meets with great Difficulties.

You muſt endeavour to ſqueeze and preſs inwards very gently the *Sternum* all along its full Length; but leave the Ribs of the Breaſt at their own Liberty, that ſo you may by this Means thruſt the Ribs outward, and reſtore them to their natural Convexity.

A Deſcription of a Skeleton of a crooked Perſon, ſuch as it was demonſtrated in the Royal Garden at Paris. *Taken from the ſame Author.*

THE Firſt *Vertebræ* of the Back are thruſt out a little toward the Right Side, but the Six following are contorted much more to the Left Side. The Interſtice betwixt the Fourth and Fifth *Vertebræ* of the Back is very wide on the Right Side, and very ſtreight on the Left: The ſame Thing is obſervable in the Interſtice betwixt the Third and Sixth *Vertebræ*. The Left Side of the Body of the Fourth, Fifth, and Sixth *Vertebræ*, is a little ſtreighter, eſpecially that of the Sixth, and their Right Side is ſomewhat wider.

The Eleventh *Vertebra* does form the Point, or a Gibboſity which is on the Left Side. The Body of this *Vertebra* is very broad on the Left Side, and very ſtreight on the Right Side.

The Cartilages betwixt the Eleventh, the Tenth, and the Twelfth *Vertebræ*, are thick on the Left Side, and very ſlender on the Right. The Twelfth *Vertebra* of the Back is very broad on the Left Side, and very ſtreight and thin on the Right. It begins to incline towards the Left Side; and the Five *Vertebræ* of the Loins are inclining towards the ſame Side; for which Reaſon it is, that the Cartilages are thick on the Right Side, and very ſlender on the Left.

The Eight laſt *Vertebræ* of the Back, and the Three Firſt of the Loins, are thruſt a little outwards and backwards; and the Eleventh and Twelfth do form the Point of that Elevation.

The Three laſt *Vertebræ* of the Loins do incurvate themſelves round upon themſelves.

The Right *Os Ilium* is much wider than that on the Left Side.

The *Sternum* and the Ribs do follow the Contorions of the *Vertebræ* of the Back; and

and the *Sternum* is very near the Figure of a *Roman* S.

The whole Spine does reſemble in its Figure alſo to a *Roman* S. There is a Gibboſity before and behind, above and below.

A ſhort Account of the Cures of Luxations. Taken from the ſame Author.

WE have hitherto ſhewn you the Differences, Cauſes, and Signs of Luxations, and from whence ariſe the Difficulties in the Cure of them; ſo that all that is remaining now to be done upon this Head, is to give you a ſhort Account alſo of the Manner of curing them.

The Cure of Luxations is ſaid to conſiſt in Three Things: *Firſt*, to reduce the Luxation; *Secondly*, to keep it in its Place after its Reductions; and *Thirdly*, to prevent, or apply proper Remedies to ſuch Symptoms as intervene.

In the Cure of Luxations therefore you muſt reduce the Bone into its natural Place, and keep it there. After you have extended the diſlocated Bone ſo far, as to clear or draw it out of the Place where it was ſettled, and that you have placed it directly oppoſite to the Cavity, or a little beyond it, they ſay you muſt thruſt it again into its Cavity, and this they call an Impulſion.

But this Impulſion is not only uſeleſs, but ſometimes alſo noxious; for the Springs of the Ligaments and of the Muſcles will of themſelvs draw the Bone into its Cavity; and by thruſting it forward, it may oftentimes ſo happen, that you put the Head of the Bone beſides its Cavity, or that you hit it with Violence againſt the Ligaments, or the Edge of the Cavity.

I do not deny but that we ought to aſſiſt and guide the Action of the Spring of the Muſcles, or of the Ligaments; and therefore, after you have made a ſufficient Extenſion, and that you are aſſured you have fixed the Head of the Bone directly oppoſite to its Cavity, you muſt let it go gently, keeping it ſteady with your Hand, for fear it ſhould ſlip beſide it.

In order to anſwer this Intention, according to our preſent Propoſition, you muſt, when you make the Extenſion, bring back the Bone by the ſame Way it went when it was diſlocated: Nay, in ſome Sort of Luxations it is requiſite you ſhould give it a quite contrary Motion to that which did produce the Luxation.

As for Inſtance; ſuppoſing you were to reduce a Luxation of the Cubit made backward by an Extenſion, you muſt make the Cubit bend in the Reduction of it; but if it ſhould prove an Incompleat Luxation made ſideways, you muſt, after having made an Extenſion in a ſtreight Line, thruſt the Cubit inwards; but if it be diſplaced outwards, and proves a Compleat Luxation ſideways, you muſt, before you make the Extenſion, if the Cubit be ſlip'd forward, reduce it by the Sides, and then manage it as we have told you.

From hence it is obvious, that each Kind of Luxation requires a peculiar Manner of Reduction; though, according to the general Rule, you muſt reinſtate the Bone by the ſame Way it came out.

When you make the Extenſion, you muſt take particular Care not to extend any other Bone but that which is diſlocated: As for Inſtance; if it be the Arm, you muſt take Hold of it above the Elbow, but not below, becauſe if you do otherwiſe, the Force of the Extenſion would light upon the Joint of the Cubit or Elbow.

When you intend to extend the diſlocated Part, you muſt do it either with your own Hands, or by one of your Servants, either with or without *Lacs*.

Theſe *Lacs* are certain Bands of ſoft and pliable Leather, or elſe of Linen, Ribands, or Threads, *&c.* wherewith you muſt embrace the Part, and then take Hold of them at both Ends.

Before you begin to draw or pull, you muſt put a good Compreſs under the *Lac*, for fear of hurting the Part.

There are Two Sorts of *Lacs*, which are diſtinguiſhed in Reſpect chiefly of their Uſes; for one of them draws at both Ends, and the other at one End only. We may make Uſe of this laſt in the Incompleat Luxations: But after all, as it is requiſite you ſhould draw equally at all Times, as well in the Incompleat as in the Compleat Luxations, 'tis better to make Uſe of that which draws at both Ends.

As it happens very frequently, that by Reaſon of the Strength of the Muſcles of the diſlocated Part, or becauſe it is an old Luxation, our Hands are inſufficient alone to make a due Extenſion, ſo it would be in vain to torment the Patients; the beſt Way in theſe difficult Caſes is to have immediate Recourſe to certain Engines, ſuch as the Gate, the Ladder, the *Moulinet*, the Beach of *Hippocrates*, the Mouffles.

If you make Uſe of the Gate, which is uſeful only in the Luxations of the lower Part of the Arm, you muſt be very careful not to let the Patient to hang altogether upon his own Weight, and not let him fall off all at once; for he may chance to break the Bone of the Arm, or the *Apophyſes Coracoides*, and the *Acromion*. Inſtead of the Gate, you may make Uſe of a Man that is much taller than the Patient.

Some have a Cuſtom in the Luxation of the Jaw, to give a Snip with the Thumb or the Chin, in order to reduce it; but tho' this ſucceeds ſometimes, it is dangerous to make Uſe of this Method.

We know when the Bone is reduced into its natural Station, by a certain Noiſe it makes, by the Alteration we obſerve in its Figure, and by the Uſe the Patient has of it without much Difficulty. It is nevertheleſs to be obſerved, that ſometimes, tho' the Luxation be very well reduced, the Patient is not able to move it, which muſt be attributed to the Contuſion which the Muſcles and Tendons have ſuffered in the Luxation.

After the Bone is reduced into its natural Poſition, you muſt make uſe of Bandages to keep it in its Place; but for the moſt Part you may do very well without them if you will, they being neceſſary only in the following Caſes:

(1.) In the Luxations proceeding from internal Cauſes, becauſe the Ligaments alſo have ſuffered a Relaxation; and this muſt be made good by Bandages.

(2.) In the Luxations of the Jaw, eſpecially if it be occaſioned by Yawning; becauſe the Ligaments which have been weakened and ſoftened before by ſome Humidity, ſtand in Need of Aſſiſtance to keep up the Jaw, the Weight of which is ſufficient to make it ſlip out again afreſh. Add to this, that the Patient can't afford this Part the neceſſary Reſt, and the Motions he is obliged to make either in Speaking or Chewing his Meats, are very apt to produce freſh Luxation.

(3.) In the Luxations of the Wriſt and Foot; becauſe, as we told you before, the firſt of theſe is moſt commonly attended with a Separation of the *Cubitus* and *Radius*, and that of the Foot with a Separation of the *Tibia* and the *Perone*. In theſe Caſes you muſt apply your Bandages from above downwards, in order to bring the Bones together gently, and to keep them firm, that they may cauſe no Compreſſion upon the affected Part.

(4.) In the Luxation of the Clavicle with the *Sternum*, you muſt ſupport the Arm by the Help of a Scarf.

In all the other Luxations there is no Occaſion for a Bandage, or not at leaſt unleſs there be an Inflammation, and then you muſt make uſe only of a containing Bandage, in order to keep on the Remedies you are obliged to apply to it.

In the Luxations of the Thigh, of the Leg, *&c.* the Patient muſt keep his Bed, to ſtrengthen the Part.

In the Gibboſities or Incurvations, you may make Uſe of Corſlets or Stays of Whale-bones, Iron-Wire, or of ſome other Matter that is ſupple and flexible; but ſuch nevertheleſs as is ſtrong enough to keep the *Vertebræ* and the Ribs ſteady.

To obviate the Symptoms which attend the Luxations; as the Inflammations, *Echymoſes*, Pains, Convulſions, you muſt firſt of all reduce the Luxations; *Secondly*, by the general Remedies, ſuch as Phlebotomy, Cliſters, Diet, *&c.* *Thirdly*, by Topicks, or external Applications, to wit, Fomentations, Liniments, Compreſſes dipped in Spirit of Wine, *&c.*

The Symptoms that don't make their Appearance till after the Reduction, are, a *Gangrene*, occaſioned ſometimes by too ſtrait Bandages, as we told you before in the Fractures; or an *Echyloſis*, becauſe the Part has been kept for too long a Time in the ſame Situation, without allowing it any Motion.

It is therefore very requiſite in long Diſeaſes, ſuch as the Fractures, the Luxation

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and Aneuriſms, in which the affected Parts muſt remain a great while in the ſame Situation, in order for the Patient to move theſe Parts from Time to Time, and that greatly, to maintain their Motion, and prevent the gathering of a gelatinous Matter in their Joints, and the ſhortening of the Tendons.

The *Enchyloſis* is a Diſeaſe of the Joints. It is of five Sorts, the firſt is occaſioned by the Coagulation and Induration of gelatinous Matter, which does ſerve for the Moiſtening of the Joints. This Diſeaſe is occaſioned by the Defect of Motion, or elſe becauſe this Humour is there in too great a Quantity, is too thick and too viſcous.

The 2d Kind of an *Enchyloſis* ariſes from an Union of the articulated Bone. This is occaſioned moſt commonly, and is the Conſequence of ſome Ulcer, or of ſome Fracture in the Joint. In this Caſe the oſſeous Fibres being corroded by the Acrimony of the purulent Matter, or bruiſed by ſome Blow, the nutritious Juice which flows from thence ſerves here inſtead of a Glue to unite the Two Extremities of the Bones.

The Firſt Kind of the *Enchyloſis* is moſt commonly attended with a Tumour in the Joint, which ſtill does retain ſomething of a Motion.

In the Second there is no Appearance of a Tumour, and the Motion of the Joint is quite loſt.

The Second Kind of the *Enchyloſis* is incurable.

The firſt may be cured in the Beginning by the Means of emollient Remedies; and frequent Motions of the Joint; but if it is of an old Date, and that there is a great Conflux of the gelatinous Matter, then it is very difficult, if not quite impoſſible, to be cured.

The beſt Remedies that are known in this Caſe, are thoſe that are qualified to ſoften and attenuate the concealed viſcous Matter in the Joint. To anſwer this Indication, you may make Uſe with good Succeſs of the Ointment of *Styrax*, mixed with, and diſſolved in the Oils of Lawrel-Berries, and Earth-Worms; you muſt moiſten your Compreſſes in warm *Aqua Vitæ*, and foment the Part with the beſt Spirit of Wine, mix'd with the before-mentioned Oils; for you muſt take Care not to make Uſe at any Time of the ſpiritous Medicines alone, without the Addition of ſome little unctuous Matters, ſuch as Oil, *&c.* becauſe they are apt to harden the Skin; as on the other Hand, you muſt always mix the Oils with ſome ſpiritous Remedies, without which they will not be ſtrong and penetrating enough.

You may make uſe alſo with good Succeſs of the Broth made of Tripe, of the *Tinctura Anodynæ*, the Decoction of wild Cucumbers, or of other emollient and reſolvent Herbs or Plants, of the viſcous Humour that is found in the Joints of an Ox, and foment the Part with Oxens Blood, or the Jelly of Earth-Worms. You may put the Part within the Paunch of a Beaſt lately killed. And laſtly, ſometimes the moſt efficacious Remedy of all proves the Motion of the Part with ſome Violence, and often reiterated, and to keep the Part warm.

Theſe Remedies are proficuous in thoſe Caſe where there is an Abbreviation and Corroſion of the Muſcles and Tendons, occaſioned by having detained the affected Part too long in the ſame Situation without moving it.

The Third Sort of an *Enchyloſis* is cauſed by a certain Liquor which commonly moiſtens the Fibres of the Muſcles; becauſe they have been detained too long in the ſame Situation without Motion. This Liquor is coagulated, and prevents the Muſcles from performing their Motions as they uſed to do, becauſe the Fibres are kept contracted or elongated by this Kind of Glue. Theſe People walk ſometimes only upon their Toes, becauſe the Foot is extended, or upon the Heel, becauſe the Foot is bent; and ſo with the reſt. In this Caſe, we make uſe of Man's Fat, of the Marrow of Stags, of Mules, the Palm Oil, *&c.* But this is ſometimes rather hurtful, and increaſes the Pain in the Part, and occaſions Eryſipelated Inflammations on the Skin, *&c.*

The ſame Inconveniencies do happen ſometimes by the Uſe of hot mineral Baths. To be ſhort, the beſt Remedy againſt the Contraction of the Tendons, is to put the affected Part into the Throat of an Ox newly killed, or in the Paunch of a Calf, or of a Mutton juſt cut open, and at laſt the reiterated Motions. If it happen on the *Cubitus*, you muſt t

muſt carry Weights, more and more by Degrees, and keep the Part always very warm.

All the Joints are very ſubject to the *Enchyloſes*, and they have been obſerved even in the Jaw; but the Knees are moſt of all ſubject to them, by Reaſon of the great Extent of the Ligaments of the Aponeuroſes which ſurround them, and the great Number of Cartilages.

Beſides the Luxations, Fractures, Softneſs of the Bones, Incurvations, Rickets, the *Enchyloſis*, the Bones are ſubject to the ſame Indiſpoſitions as the Fleſh, to wit, Contuſions, Inflammations, Ulcers, Tumours, and Wounds, *&c.*

Of Diſlocations. Taken out of Mr. Richard Wiſeman, *&c.*

Of Luxations in General.

WHen Two Bones which, by their natural Union make up a Joint, are ſeparated from one another, we call it a Luxation.

The Ancients did call it a Slipping of the Head of a Bone out of its Cavity, which may take Place in the great Joints, but not in all; for the broad End of the *Clavicula*, where it does reſt upon the *Scapula*, hath neither Head nor Cavity, and nevertheleſs is capable of Luxation.

Luxations admit of ſeveral Differences.

(1.) From the Subject: Whether it be a Place of an obſcure or of a manifeſt Motion. As for Inſtance, when the *Clavicula* recedes from the *Scapula* which by the *Arabians* is called a Disjunction; or elſe when an Elbow, Shoulder, *&c.* is disjointed, which is properly called a Luxation. There is a Luxation alſo which is peculiar to Children, to wit, when the Appendage of a Bone is ſeparated from the Bone, becauſe they are not very well conſolidated into one; but this rather belongs to a Fracture.

(2.) From its Degree: Whether it is wholly disjointed, or only in Part; to wit, to the Edge of the Cavity that contains it; unto theſe Elongations, which are occaſioned by a Humour ſoaking upon a Ligament, (as upon the *Corea*) making it ſubject to be ſtretched, and to be thruſt quite out upon every little Force.

(3.) From the Situation and Figure of the affected Part; as, Whether the Luxation does happen upwards, downwards, forwards, or backwards, on the Right or on the Left Side: Of which more hereafter.

(4.) Their Differences may alſo be taken from the Symptoms that moſt uſually attend them, as Inflammations, Wounds, Fractures, *&c.*

The Cauſes of Luxations are either *Internal*, or elſe *External*.

The *Internal* are thoſe Humours that are apt to affect the Joints, which is effected either by cauſing a Relaxation in the Ligaments, to give Way to the Bone to depart from its natural Station; or elſe, by a Contraction of the Tendons of the Muſcles, pull it upwards out of its Cavity. Both theſe are often obſervable in Children, and in all Probability are Hereditary; as *Sennertus* has very well obſerved, *A Gibboſis, Gibboſos; & a Claudis, Claudos, generari.*

The external Cauſes, are Blows, Falls, violent Extenſions; in which latter Caſes, Infants do ſuffer ſometimes for the Neglect or Ignorance of the Midwives, or elſe of their Nurſes.

The Signs of a Luxation are taken either from the total Loſs of or from the imperfect Motion of the Joint; as alſo from the different Figure it hath from the oppoſite ſound Part or Member; for there appears either to the Eye or the Contact, a Cavity in that Part from whence it is receded, and a Protuberancy where it is lodged. The Member is alſo rendered longer or ſhorter as the Bone is diſtorted.

The Signs of Reduction are quite contrary to thoſe that have been mentioned before.

When the Bone is thruſt again into its Cavity, there is heard a cruſhing Noiſe made by the ſaid Bone; tho' this is not always a certain Sign, becauſe this Noiſe may proceed from the Eruption of ſome Part of the Edge or Brow of the Cup or the Cavity; and when ſo it happens, the Luxation is for ever rendred incurable, or incapable of Reſtitution. But there is a conſiderable Difference made by this

this Eruption, and that occaſioned by the Bones ſlipping into its Cavity again, and may eaſily be diſtinguiſhed by an expert Chirurgeon.

The Luxations of the Bones are ſooneſt reſtored in Children, and Bodies of a moiſt Conſtitution; but at the ſame Time are not retained without much Difficulty: But in Perſons advanced in Years, and thoſe of a dry Conſtitution, the contrary does happen.

Old Luxations are very hard to be reduced, and for the moſt Part are as hard to be retained, becauſe the Parts grow emaciated. The Luxations of the *Vertebræ*, occaſioned by external Violences or Accidents, prove moſt generally mortal; but thoſe cauſed by Congeſtion, are oftner cured.

The luxated Bone does make a Compreſſion upon the adjacent Parts, where it is lodged after its Luxation; and according as theſe Parts are of a more or leſs exquiſite Senſe, ſo will be the Pains and the Symptoms that attend it. The Reduction of the Bone muſt be haſtened with all poſſible Speed. This Operation is purely Chirurgical, it having not the leaſt Dependency upon Nature; for both the Extenſion, and thruſting back of the Bone into its natural Poſition, muſt be done by the Hands of a dextrous Chirurgeon.

Four Intentions are required to the Cure: (1.) The Extenſion. (2.) Repoſition. (3.) Deligation, and (4.) Collocation, or the reimplacing of the Member in its proper Poſition.

Extenſion challenges the firſt Place, by Reaſon of the Situation of the diſlocated Bone, which being put out of its proper Cavity or Socket, does render the Motion of the Muſcles uſeleſs, or rather hurtful; for the more they pull the Bone, the more they diſtort it, and cauſe a Contraction in the affected Joint: And hence it is that this Work can't be committed to Nature, but requireth a manual Operation.

So ſoon as you have made a due Extenſion, you muſt at the ſame Inſtant endeavour its Reduction into its proper Place from whence it fell. To perform this, you muſt have a due Regard to the luxated Joint, and which Way it ſlipped out; for it muſt be reimplaced in the ſame Manner.

If it be lodged on the Right Side, it muſt be preſſed back toward the Left; and in the ſame Manner, if the Luxation is made forwards, it muſt be thruſt backwards.

The Repoſition of the Shoulder does require one Way, the Elbow another, the Reduction of the Knee another, and of the Ankle likewiſe another.

If the Luxation is of an old Standing, or if the Contraction of the Muſcles be great, it will be very requiſite you ſhould firſt endeavour their Relaxation by emollient Embrocations, *viz.* the *Unguent. Dialthææ, Axung. Human. &c.* leſt by the violent forcing in of the Bone, you affect the Nerves, and cauſe a *Paralyſis, &c.*

Being ſatisfied in the Repoſition of the Bone, the next Care you are to take is to provide for its keeping it in its Place. This is performed by Deligation.

But before you apply the Bandage, you ought to apply ſuch Remedies as are endewed with a Vertue to ſtop the Influx of the Humours, and to ſtrengthen the Part. The Adſtringents do beſt of all anſwer theſe Indications, ſuch as are commonly made uſe of in the Fractures; to wit, *Bol. Armen. Sang. Dracon. Farin. volat. Balauſt. Flor. Roſ. rubr. cum Album Ovi, in Aceto, aut Vin. rubr.*

If there be great Pains, you may embrocate with the *Ol. Roſar. Lumbricor*, and *Vin. rubr.* and apply the *Empl. e Bolo, Diapalm. de Minio, &c.* After this apply a Compreſs wrung out of ſome of the before-mentioned Liquors to that Part whither you may ſuſpect the Bone will tend, and rowl it on cloſe, according as Occaſion ſhall require.

The laſt Intention is *Collocation*, or the reimplacing of the diſlocated Member. This muſt for the Eaſe of the Patient be laid ſoft, and ſomewhat raiſed up, neither too much bent, nor too much extended, a Medium betwixt both being the moſt convenient to prevent Pain.

Yet if the Shoulder has ſuffered a Luxation, the Elbow muſt be kept to the Side, ſo as that the Hand lies upon the Breaſt. Unleſs there happen ſome Symptoms, you muſt not dreſs it again till the Seventh Day, and then it will be requiſite you ſhould alter the Poſition, and ſtir the Joint gently to and fro, and dreſs it up with ſuch Remedies as may give a Breathing to the Humour that

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lies in the Interſtice of the Joint, and ſuch as may corroborate it. If it itches, bathe it with ſalt Water, or elſe with the Decoction of the *Summit. Abſinth. Flor. Chamæm. Roſ. rubr. Balauſt. Bacc. Myrtill. Juniper. Nuc. Cupreſs, &c.* unto which you may alſo add ſome Spirit of Wine. All unctuous Remedies are noxious, for they relax the Tendons, and prolong the Cure.

Luxations made by Congeſtion require Emollients, and ſuch other Remedies as diſſolve and breath forth the crude and coagulated Humours that affect the Joint, Ligaments, and Tendons; as for Inſtance, this Cataplaſm:

Rs. *Rad. Althæa, Unc.* vj. *Rad. Cucumeris Aſinini, Unc.* iij. *Summit. Majoran. M.* ij. *coctis in Brodio, ex Pedibus Vitul. & contuſis. Adde Pulv. ſem. Fænugræc. & Lini, ana Unc. j. Ol. Lilior. Axung. Human. ana Part. æqual. fiat Cataplaſma.* You may alſo apply the *Empl. Dyachil. cum Gumm. de Mucilag. de Ranis, cum Mercurio, &c.*

After the Humour be diſpelled, you may then proceed to the Reduction of the diſlocated Bone; and after its Reduction, apply to it ſuch Remedies as may dry up the Remnants of the Humour, and ſtrengthen the Joint, ſuch as have been mentioned in the Fourth Intention. You muſt make Uſe alſo of proper Bandages to keep the Bone in its Station; but of that, we ſhall have Occaſion to ſpeak more at large in the following particular Obſervations, as alſo of the *Paralyſis, &c.* which often does attend great Luxations.

Some curious Remarks of Fabricius Hildanus, *Mr.* Wiſeman, Muſitanus, *and others, upon Wounds of the* Cranium. *Their Chirurgical Operations.*

Fabr. Hildanus, Cent. 1. *Obſ.* 13. relates, That he had ſeen a Woman, who after having received a contuſed Wound on the right *Parietal Bone*, which was broken and depreſſed by the Blow, vomited Bile and crude Aliments. He took off about Four Fragments of the Bone, and a ſmall Portion of the Brain, about the Bigneſs of a Bean. The next Day he removed more Splinters of the Bone, with a Portion of the Brain about the Bigneſs of a Hazel Nut. He continued to take off ſeveral more ſmall Portions of the Brain, notwithſtanding which the Patient was perfectly cured.

In the ſame Obſervation, he aſſures us he had ſeen a Maid wounded on the Head, who had ſeveral large Fragments of Bones taken out, and the *Meninges* being rotten, one Side of the Brain lay bare. For the Space of Three Weeks together the Surgeon was obliged to remove ſome Portion of it, which Nature ſeparated, ſo that one Part of the Brain was entirely taken out. However it lay thus open, ſeveral carnous Tubercles ſprung up on its Subſtance, of which each was as big as a *Vetch*. Theſe Tubercles ſenſibly encreaſing, joined one to another, forming a pretty ſolid carious Tegument, which filled all the Cavity of the Brain, and covered it, and the Girl in all Appearance recovered her Health; but the Cure of this Wound being neglected, ſhe died Six Months after. That which occurred moſt worthy of Remark in this Caſe was, that in the Beginning of this Cure the Patient did all her ordinary Buſineſs about the Houſe, as if ſhe had been perfectly well, without any Pain or Feaver.

Some Years ago there was in the *Hotel Dieu* at *Paris* a certain Woman, who receiving a Blow on the Head, the Teguments were all corrupted, and a Moiety of the Skull was laid bare. Both Tables exfoliated, ſo that Part of the *Frontal Bone*, and a Moiety of the Two Parietal Bones came away all at a Time; and this bony Caſe being removed the Brain lay bare, and its Motion was very diſcernable. By Degrees it was covered again by a carnous Matter, which conſolidated; but this Cover never arrived to ſuch a Degree of Hardneſs, as to reſiſt the Impreſſion made by the Motion of the Brain. Upon the leaſt Touch imaginable with the Finger on this carnous Membrane, the Woman inſtantly ſeemed to ſee a Thouſand Candles. She had a Cap of Lead made to cover the Part, and defend it from external Injuries, and carried about the exfoliated Bone as a Cup to receive Alms in.

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The ſame Author informs us, he had ſeen a Child of Ten Years of Age, who had a great Depreſſion on the Occipital Bone upon a Fall. No dangerous Accidents appearing at firſt, the Parents neglected the Cure. The Child, who before was very witty, loſt his Memory and Judgment, and was rendred incapable of Study or learning a Trade, and at Thirty Six Years of Age became perfectly ſtupid.

He farther relates, That a Child of Three Years of Age falling upon his Forehead, made a Depreſſion large enough to turn the Little Finger in. No other Application was uſed beſides a Compreſs dip'd in *Spirit* of *Wine*, and renewed every Day, and the Child was perfectly cured, without any Inconvenience remaining behind. Theſe Relations compared, make it evident, that the Functions of Life are not performed in all Parts of the Brain, ſince the Depreſſion of the Occipital Bone in one produced a Stupidity, and yet in the Frontal the ſame Accident was attended with no Conſequence prejudicial to the Patient.

If Wounds of the Head are attended with extraordinary Accidents, they ſometimes prove very ſerviceable to the Patient. *Fabr. Hildanus* aſſures us, That a certain Perſon having the *Cranium* fractured at the Concourſe of the ſagittal and coronal Suture, by this Wound was cured of a *Vertigo* of long ſtanding, where remained a ſlight Ulcer on the Place of the *Fracture*, which perhaps effected this Cure by the Diſcharge of Matter.

Sckenkius tells us, a certain *Epileptick* Perſon happening to have a Fracture on the Skull, was by this Means cured of a Diſtemper, with which he had been for many Years afflicted.

In caſe there happen ſuch a *Fracture* in the Skull as to cauſe one or more Depreſſions of the Bone; becauſe, according to *Hippocrates*, there can be no Depreſſion in the Bone unleſs it be quite cracked through: In this Caſe, the Crack is either broad or narrow, and the Depreſſion either deep or ſhallow.

If the Crack in the fractured Bone be broad, and the Depreſſion not very deep, we make uſe of the *Vectis*, or a *Leaver*, which were put under the Bone. Of this there are Three Sorts, which differ only in their Magnitude or Size, one being larger and ſtronger than the other, which we make Uſe of as Occaſion ſerves; for in caſe the leaſt of all prove inſufficient, we uſe the other, which being ſtronger, heaves up the Bone with a greater Force than the former, becauſe its Strength lies not only in the Hand, but in the Head alſo. If this be not of ſufficient Strength, we then have Recourſe to the *Triplois*, ſo called from being ſtrengthened with a Threefold *Baſis*, but otherwiſe like the *Vectis* or *Leaver*. If there be ſufficient Room, we put the *Vectis* of the *Triplois* under the Bone; but if there be not, we make a Perforation in the Bone with the other ſharp-pointed *Vectis* of the *Triplois*. If the Depreſſion of the Bone be on one Side only, we make uſe of the firſt and ſecond Inſtrument; but if on all Sides of the *Triplois*, then there is no Room for the Application of the *Vectis*.

If the *Fracture* have penetrated quite thro' the Skull, but without any Depreſſion in the Bone, then you muſt proceed to the Exciſion, or elſe the Perforation of the Bone, to prevent the Deſcent of the virulent Matter to the inward Parts, and to give Vent to the *Sanies*, or what elſe may be obnoxious within. This is performed by the *Trepan*, which, according to *Celſus*, is made up of Two Parts, the *Terebra* and the *Modiolus*, which have been largely deſcribed already.

Two Things are chiefly obſervable in the Perforations made in the Skull, as being ſubject to no ſmall Danger. One of them has Relation to the Place where the *Terebration* is to be made, and the other to the Inſtrument; but both have Regard to the impairing the *Dura Mater*. In Reference therefore to the Place, Care muſt be taken not to attempt the Perforation upon the *Pericranium*, and therefore the Bone muſt be laid bare beforehand, becauſe without this Precaution moſt violent Inflammations would enſue, by Reaſon of the nervous Subſtance of the *Pericranium*, neither muſt this *Terebration* be made in the Sutures, becauſe the Inflammation would ſoon be communicated to the *Dura Mater* that lies underneath. Beſides, that under the *Sutures* are the *Sinus's* of the *Dura Mater*, repleniſhed with Blood Veſſels; or on the Sides at the Temples, and of the

Sinciput; becauſe thereabouts the Blood Veſſels are diſperſed through the Interior Part of the Skull, and form certain ſmall Gutters or Channels in the Bone; for which Reaſon it is, that no Perforation can take Place in thoſe Parts, for the Blood Veſſels that lie betwixt the Skull will ſuffer a Diſruption, and the Blood will deſcend upon the *Dura Mater*, to the great Danger of the Patient.

The Second Danger relates to the Inſtrument; for it ſeems almoſt next to an Impoſſibility that the Bones of the Skull ſhould be perforated without proving offenſive to the *Dura Mater*, and that for Two Reaſons: Firſt, by Reaſon of the Weight of the Inſtrument it ſelf; which will, as ſoon as the Bone is perforated, deſcend and bear downwards, not only upon the *Dura Mater*, but alſo upon the *Pia Mater* and the Brain it ſelf, and with its pointed Extremity will prick and occaſion a Solution of Continuity in the *Dura Mater*. The firſt of theſe Inconveniencies ariſes from the Handle by which it is turned, and the Second from the inferior Part of the Inſtrument or *Modiolus* which is turned. The Ancient, as well as the Modern Surgeons, very ſenſible of theſe Dangers, have invented ſeveral Ways to prevent both theſe Inconveniencies, tho' in this Attempt they have laboured under no ſmall Difficulties: For ſince there is an abſolute Neceſſity to preſs the ſuperior Part of the Inſtrument downwards, without which it would be in vain to attempt the Perforation of ſo hard, thick, and ſolid a Bone, it may eaſily happen that the Inſtrument may penetrate too deep. In the ſame Manner, ſince the *Dura Mater* is almoſt every where adhering to the Bone, it is almoſt next to an Impoſſibility that it ſhould not be wounded by the pointed End of the Inſtrument, and therefore they have contrived all poſſible Ways to prevent the Inſtruments from ſlipping too far inwards.

To be ſhort in this Matter, they have, as far as humane Invention could ſtretch, endeavoured to render theſe Inſtruments in the Perforation able to act with Expedition, Safety, and little Diſturbance: With Expedition, becauſe if the Operation be retarded, it tires the Patient, the cold Air enters and affects the Wound, and Inflammations follow: With Safety, by Reaſon of the great Danger that threatens the Patient from the *Dura Mater* if it be wounded: With little Diſturbance, that is, without Noiſe or needleſs Fatigue, which ſerve only to cauſe an Abhorrence to ſuch like Operations, as well in the Patient as the Standers by. Hence it is, that among all the various Sorts of *Trepaning*, as well of the Ancients as the Moderns, the *Terebra* and the *Modiolus*, which are made without any Stop or Check upon them, are unfit for this Purpoſe, becauſe they are apt to penetrate too deep; as are likewiſe thoſe which may eaſily wound the *Dura Mater* by their ſingle acuminated Points. For which it is, doubtleſs, that the *Terebra* is out of Date, as well as the *Modiolus*, which has long and large Teeth, and ſuch as are placed at a Diſtance one from the other; for you may take this for a General Rule, the ſmaller theſe Inſtruments are in every one of their Dimenſions, the more convenient and ſafer they are for this Purpoſe, and cauſe the leſs Dread to the Patient, provided they are ſuch as will anſwer the End for which they are deſigned.

'Tis upon this Account, as I told you before, that Authors have invented ſeveral Ways to prevent the Immerſion and Punction of thoſe Inſtruments upon the *Dura Mater*. Some have cauſed a Kind of a Stop or Notch to be made which ſurrounds the Inſtrument. This is in the *Terebra*; but in the *Modiolus*, where there is no ſuch Notch, they have inſerted another Stop, to check its dipping down; for they have made a circular Prominency exactly above the Teeth, which ſtands fixed there. Others have made this Stop moveable, by which Means they may let the *Modiolus* ſlip in deeper by Degrees, as they judge it convenient. Others again have provided the *Modiolus* with a double Row of Teeth one above the other; and others make Uſe of a broad *Modiolus*, which therefore cannot wound the *Dura Mater*: And of this Kind they make uſe of Eight, ſo as to begin with the larger, and ſo by Degrees come to the leaſt of all.

Others make uſe of the filed *Modiolus* in the ſame Manner, which is incapable of wounding the Membrane, partly becauſe its Extremity is broad, and not ſharp-edged. Others have the *Modiolus* provided with

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ſpiral or winding Stops, and others again with Four Rings placed at the Length of the *Modiolus*, which prevents its penetrating into, and conſequently its wounding the interior Parts, becauſe theſe Things are ſmaller at the Edges where the Teeth are, but bigger at the ſuperior Part.

To give you the Sentiments of Authors upon theſe different Sorts of Inſtruments: The Firſt *Modiolus* is not without Exception, becauſe the Stop being made immoveable, the Inſtrument is not adapted to the Perforation of divers Sorts of Skulls; as that of a Child and a Perſon advanced in Years, nor even to all Perſons of the ſame Skull, which are the thicker in ſome, and thinner in other Places.

The Second Sort of *Modiolus*, with the moveable Stops, would give much more Satisfaction, were it not that it works but ſlowly, which muſt of Neceſſity be ſo, becauſe the moving of the Stop takes up a great deal of Time.

The Third Sort of the *Modiolus*, which is provided with a double Row of Teeth, one below and the other above it; as of Neceſſity it produces a double Perforation in the Skull at the ſame Time, ſo the Operation is very laborious and difficult.

The Fourth Sort, which is provided with Wings, being broad, the Operation proceeds with leſs Expedition than any of the preceding; and the ſame Thing may for the ſame Reaſon be ſaid of the filed and winding *Modioli*, and therefore they are not made Uſe of; but thoſe provided with Four Wings are preferable to the others, becauſe they have a firm and ſteady Stop, and at the ſame Time the uppermoſt being larger than the inferior, it may be adapted to all Sorts of Skulls, without any Trouble or Danger of protracting the Operation.

Of the Method of curing Fractures and Luxations. From Mr. Vaugion's *Compleat Body of Chirurgical Operations, and Mr.* Petit's *Art of curing the Diſeaſes of the Bones: Both printed this laſt Year in* French. *With a particular Caſe of the Luxation of the* Patella, *and a Fracture of the Thigh. By* George Ryley, *Surgeon, at* Namptwich *in* Cheſhire.

I Need ſay nothing of Fractures in general from either of theſe Authors, they having been ſo fully explained already; neither will it be neceſſary to add any Thing concerning the Cauſes or Signs of Fractures, they being ſo obvious to every Body, had not they been remarked already. But the Surgeon's Buſineſs in the Cure of a Fracture is only to bring the Two Ends of the Bone together, and heal them when he has done, ſo that they may firmly unite together as before. In performing this Operation, the Hands are chiefly to be uſed, except there be a Fracture in the great Bones, and the Artiſt be obliged to make uſe of Machines, eſpecially if the Parts of the Bone ride on one another, and the Muſcles be very ſtrong.

The Signs of Cure in a Fracture are, Firſt, a Ceſſation of Pain; and Secondly, the Part recovering its natural Figure. When the Bone is reſtored, make ſome proper Bandage. When there is a Fiſſure only, let the Part be bound ſtrait, that ſo the Fracture may reunite. When there is a large ſoft Tumour on the Fiſſure, which ſeems to be filled with Blood collected there, or a certain Liquor which exudes out of the Bone, it may be opened to give Vent to the Humour contained in it, and the Orifice kept open with a Tent, and treated in the ſame Manner as a complicated Fracture, and the Bone and Wound healed together.

When a Bone is reduced, Care muſt be taken to remove the Inflammation by the Uſe of proper Medicines, as embrocating the fractured Part with a ſimple Tincture of Flowers of *St. John's-Wort* in *Spirit of Wine*, or the Compound made with *Earth-Worms*. If the Part be contuſed, chafe it with a Mixture of *Honey and Spirit of Wine*. *Junctions* with Oil of *St. John's-Wort*, Fomentations made with a Decoction of *Roſemary* in Wine, and a Liniment of Oil of *Earth-Worms* and *Turpentine* are very good.

Beſides this, all inward and outward Means muſt be made uſe of: The *Lapis Oſteocollæ* in Comfrey Water is a good *Specifick*;

but it is not convenient to continue the Uſe of it too long a Time, for Fear it breed too large a *Callus*. *Hildanus*'s Powder is very good, or mix *Oſteocolla* in a Decoction of *Periwincle* Water, and drink ſeveral Draughts of it. The Fracture muſt be unbound the Third or Fourth Day, to ſee in what Condition it is, and then muſt be bathed in a Decoction of the vulnerary Plants. The Bandage muſt not be too looſe nor too ſtrait. In Fractures, eſpecially where there is a Contuſion, if the Nerves, Ligaments, Tendons, or any like Parts happen to be contorted or diſlocated, *Foreſtus* his *Cerecloth* may be applied on the Sixth or Seventh Day.

Recent *Fiſſures* are eaſily cured, there being nothing more required than the laying on ſome good *Catagmatick* Plaiſter of *Roſin* and *Comfry Roots*, either with or without Splints, as Occaſion ſhall require. The Part muſt be well bound, to conſolidate the Fracture; and if there be a ſoft Tumor, which yields to the Impreſſion of the Finger, it muſt be opened to let out the Matter, and the Orifice encouraged with a Tent, ſo that the Wound may be dreſſed like a complicated *Fracture*. When the Extremities of the broken Bone ſtick out of the Wound, and are corrupted by the Air, the End muſt be filed or taken off with Pincers, eſpecially if the Point of the Bone pierce the Skin, and cannot be reduced to its natural Place, and the Wound muſt be kept open for a conſiderable Time, to give the Fragments an Opportunity of Reuniting or Exfoliating. If the Splinters are ſeparated, and neither adhere to the Bone or *Perioſteum*, they muſt be fetched away with a *Forceps*; but if they adhere, the beſt Way is to let Nature alone, by aſſiſting her with proper Applications.

Of the Fractures *of the Noſe.*

IF this Part be not reduced ſpeedily, it is ſoon filled with *Ozena's*, or ſtinking Ulcers, and incurable Excreſcencies of the *Polypus*, the Party cannot breath through it, and Loſs of Smelling enſues. I need not trouble you with a Deſcription of the Part, that having been done fully in its proper Place, therefore ſhall proceed to the Cure. Place the Patient in a convenient Poſture, and then taking a Stick, cut it flat and ſmooth, and wrapping it round with Cotton, introduce it with the right Hand into the Noſe, to raiſe up the fractured Bones which are depreſſed; obſerving to lay the Thumb of the left Hand on the fractured Bone, that ſo raiſing it on the Inſide, you may bring it to its natural Figure; and when you have reduced one Side, you may do the ſame on the other if there be Occaſion. When the Bones are reduced, put a leaden Pipe up the Noſtrils to keep them in their due Situation. This Pipe muſt be made flat, and of a Figure accommodated to the Part, that ſo there may be no Danger of hurting it; which to prevent, anoint the Pipe with *Balſam* of *Peru*, or Oil of *Turpentine*. If there be a Wound which can ſcarce happen, lay proper Medicines on to procure a good Digeſtion, there being no Poſſibility of avoiding a Contuſion, and a Plaiſter on the Pledgit, on which lay Compreſſes, and a triangular Paſtboard, keeping them on with a Sling or Fillet with Four Tails. There is another Bandage ſometimes, which is called the *Foſſa* of *Amyntas*. This is made with a Roller, an Inch and a half broad, and Two Ells in length, rolled up at both Ends. There is a Third Bandage, which is ſometimes made uſe of in Fractures of the Noſe, which is called the *Accipiter* or *Hawk*. To make this, take a Rag and cut it into the Shape of a Triangle, which may be large enough to cover all the Dreſſings on the Noſe, and ſtitch a narrow Fillet about a Quarter of an Ell in length, and Three Quarters of an Inch broad, to the upper Angle of this Triangle, and lay this Fillet over the Sagittal Suture, and let it hang down behind; then ſtitch Two more to its lower Side, *viz.* to each Angle, and bring them over the Cheeks; tie them to that which paſſed over the Sagittal Suture. Beſides theſe, ſtitch two to the Bottom of the Triangle, which muſt be Two Ells in length, and more than an Inch broad; croſs theſe Two under the Noſtrils, riſing obliquely on the Cheeks to the Side of the leſſer Angle of the Eye, and ſo making an X behind the Head, bring them forward again, and croſs them on the Noſe, then bring the Two Ends round the Forehead and pin them. This Triangle muſt have Two Holes in the Place of the Noſtrils for Breathing. Dreſs the Part once

once a Day, forbearing to remove the Pipe till the Bones are conſolidated.

Of the Fracture *of the lower Jaw-Bone.*

IF the Bones of the Jaw ride over one another, ſome of the Aſſiſtants muſt put his Fingers into the Patient's Mouth, and make a ſlight Extenſion, whilſt the Surgeon preſſes the Extremities both within and without. If the Teeth are looſe, put them into their natural Places, where they will ſoon fix again, if they be tied with a Silver or a Waxed Thread to thoſe Teeth which ſtand firm. When you make your Dreſſing, lay on the Jaw a Compreſs of a competent Length, made of Rags ſeveral Times doubled, and dip'd in ſome Defenſatives; then cover this with a Paſtboard of a Figure not unlike the Jaw, and make the Bandage called the *Capiſtrum* or *Bridle*. To make this, take a Roller of Two Ells long, and an Inch and half broad, and begin with a circular Turn round the Head, than paſs under the Chin, and riſe on the Cheek, paſſing near the leſſer Angle of the Eye; then go obliquely behind the Head, on the oppoſite Cheek, and under the Chin, and reaſcend on the firſt Turn of the Roller, making an Edging on the fractured Jaw, then continue to proceed round, paſſing behind the Head.

If the Jaw be broke on both Sides, reduce it in the Manner above deſcrib'd, and lay a Compreſs with a Hole in the Middle on it to put the End of the Chin thro', and ſo apply each End on the Sides of the Jaw reſpectively. Over theſe ſtitch a Paſtboard of a Figure adapted to the Jaw, and perforated in the midſt likewiſe, and keep theſe on with a double *Capiſtrum* or *Bridle*. Let the Patient lie on his Back, for Fear leaſt the Bones ſhould be diſplaced by lying on one Side.

Fab. Hildanus gives a Caution not to continue the Uſe of the *Lapis Oſteocolla* too long, leſt it make too large a *Callus*, and the Part become monſtrous and deformed; as he relates it once happened to him in a Fracture of the Thigh. When the *Callus* grows ſo large as to make a ſenſible Deformity, *Hildanus* uſes this Method: Firſt, he foments the Part twice a Day with this Emollient Decoction. Rs. Roots and Leaves of *Marſh Mallows*, *Briony*, *White Lillies*, *Brank Urſin*. Flowers of *Melilot*, *Camomile*, *ana* one Handful; common *Wormwood*, *Red Roſes*, *ana* half a handful; *Linſeed*, *Fenugreek* Seeds, *ana Unc. j.* boiled in Vinegar and Spring Water. After fomenting with this, anoint with a Liniment of Bears or Man's Greaſe, two Parts; Juice of Earth-Worms and Vinegar, of each one Part.

Of the Fractures *of the* Clavicle *or Collar-Bone.*

IF the *Clavicle* be broken aſunder, an Extenſion muſt be made: For this Purpoſe place the Patient on a Stool without a Back, and draw back the Arm which is on the ſame Side with the Fracture, and let an Aſſiſtant ſtand behind and puſh the Shoulder up, whilſt another draws the Arm back. While this Extenſion is making, reduce the Bones, by thruſting back that End of the Bone which is above, and drawing that below, ſo that both may exactly meet; and you may diſcover that they do ſo, by feeling with the Thumb all along the Bone. If there be any Splinters which run into the Fleſh, make an Inciſion into the Place which is pained, and lay the Bone bare, to reduce the Splinters, and cut off the Aſperities which prick the Fleſh with Pincers. When the Bone is reduced, fill the Cavities above and below with Compreſſes of a Length and Figure ſuitable to the Bone, and over theſe Compreſſes lay others of the ſame Figure. Let each Compreſs be ſtitched to a Paſtboard of the ſame Figure with themſelves, and keep theſe Dreſſings with the Bandage called the *Capeline*. If the *Clavicle* be broke near the Shoulder, you muſt make the Bandage called the *Spica*, deſcribed in the *Luxation* of the Shoulder. Let the Patient lie on his Back; for if he ſhould lie on one Side, there would be Danger of the Bones falling out of their Places.

Of

Of a Fracture *of the Shoulder-Blade.*

IF any Fragments of Bones are broke off, and thruſt out without pricking the Fleſh, put them into their Place with the Palm of the Hand, or the Thumb; but if they have any Points, and prick the Fleſh, make an Inciſion, and ſnip off the jagged End with a Pair of Pincers, and reduce the Bone into its right Place if it adhere to the *Scapula*; but if it be looſe, take it off. For your Dreſſing, lay a Compreſs dip'd in ſome defenſative Liquor on it, and a Paſtboard over that, both of which ought to be as large as the Shoulder-Blade, and to have the ſame Figure; and then keep all on with the Bandage commonly called the Star. If there be a contuſed Wound on the *Scapula*, you muſt digeſt and deterge the Wound, dreſſing it twice a Day; but if a ſimple Inciſion, unite as faſt as you can with a Defenſative.

Of the Fractures *of the Ribs.*

WHen a Rib is entirely broke, the Ends ſometimes thruſt into the Breaſt, and at other Times continue in their natural Places. If a Rib thruſts in, it compreſſes and tears the *Pleura* and the Lungs ſometimes, and this creates a great Pain, the Patient cannot breath without Difficulty, but ſpits Blood, and a Feaver is raiſed. If the fractured Ends thruſt out, there is a ſenſible Riſing; but if the Two Ends of the Bone continue together, none of the above-mentioned Symptoms appear, and there is only a Craſhing that can be perceived in thruſting the Ribs with the Thumb. If the Rib which is hurt thruſt out, place the Patient in a Chair, and let an Aſſiſtant ſtand by to hold him; then bid the Patient bend his Body on the Side oppoſite to the Fracture, and keep cloſe his Mouth and Noſe; and hold his Breath to dilate his Breaſt, this Dilatation ſerving inſtead of an Extention; in the mean Time, thruſt the Two Ends of the Bone together, and reduce it. If one End of the Bone enter the Breaſt, make an Inciſion, and take it out. For your Dreſſing, lay a ſingle Compreſs dip'd in ſome Defenſative on the fractured Part, and lay Two other longitudinal Compreſſes over it, which muſt croſs each other ſalter-wiſe; then ſtitch Two Paſtboards of the ſame Figure with themſelves to the Two laſt Compreſſes, and lay another large Linen Compreſs, with an oblong Paſtboard, and cover this again with a Compreſs. In the laſt Place keep all on with the Bandage called the *Quadriga*.

Of a Fracture *of the* Sternum, *or Breaſt-Bone.*

THE Signs which demonſtrate the *Sternum* to be fractured, are a Depreſſion of the Part, a Palpitation of the Heart, a Difficulty of Breathing, *Delirium*, and oftentimes a Spitting of Blood. Theſe Symptoms proceed from a Compreſſion of the *Mediaſtinum*, Heart, Lungs, Nerves, and other Veſſels. Let the Patient be laid on a Quilt on the Ground, and place ſome Convex Body under him between his Shoulders, and let ſome Servants preſs on the Sides of the Breaſt which puſh out, and by this Extenſion the Bones may be reduced into their natural Situation; or if this proves ineffectual, make an Inciſion, and lay the fractured Bone bare, that ſo you may raiſe it with the *Terebellum*, or Screw. This muſt be exquiſitely ſharp, that it may enter the Bone upon touching it in the lighteſt Manner imaginable; for if it were quite depreſſed, it would infallibly kill the Patient. In Dreſſing, lay a triangular Compreſs wetted in Wine heated, and over that another thick triangular Compreſs ſtitched to a Paſtboard of the ſame Figure, and let the Point of this be applied downwards. In the laſt Place, keep the Dreſſings on with a Napkin folded in two or three Plates, ſuſpended with the Collar in the ſame Manner as has been directed. Let the Patient lie on his Back, and his Wound be dreſſed twice a Day. Some Surgeons have had Sagacity enough to diſcover when there has been *Pus* lodged in the Cavity of the *Mediaſtinum*, and have dextrouſly diſcharged it, by opening the *Sternum* with a *Trepan*.

Of a Fracture *of the* Vertebræ.

THE Fracture of the Body of the *Vertebræ* is dangerous; becauſe the ſpinal Marrow, which is the Origine of the Nerves, is hurt upon theſe Occaſions. The Fracture of the ſpinal Proceſſes is not ſo dangerous as that of the Body of the *Vertebra*, becauſe the *Medulla* is not hurt by it. Since the *Spine* cannot be fractured unleſs there be a Depreſſion of the Bone, place the Patient on his Belly, for the better making an Inciſion on the fractured Place, and taking out thoſe Splinters which preſs or prick the ſpinal Marrow and Nerves. If only the Proceſſes of the *Vertebræ* are broken off, place the Patient on his Back, and ſo reduce them as conveniently as you can. If the Body of the *Vertebræ* be hurt, lay on a Compreſs dip'd in warm Wine, or *Oxycrate*, and keep it on with the Napkin and Scapulary.

Take Care not to ſtraiten the Bandage too much, for Fear of preſſing down the Fragments of Bones which you have raiſed on the ſpinal Marrow. If it be the Spine of the *Vertebræ* which is broke, lay a ſmall Plate of Lead with a Compreſs on each Side, to retain the fractured Bone in its Place, and lay over it a Compreſs dip'd in ſome good Defenſative; and keep this on with the Napkin and Scapulary. When the Bones are reduced, let the Patient lie on his Side; and if any Inciſion be made to reſtore the Bones to their Place, dreſs this like all other contuſed Wounds, that is, digeſt, deterge, and cicatrize it.

Fabr. Hildanus, Cent. 1. *Obſ.* 45. relates, That a young Man being Hunch-Back'd and Aſthmatick from his Cradle, died of a *Phthiſis* at 16 Years of Age. Upon Opening of the *Cranium*, he found the *Criſta Galli* very high, and ſo large, that it covered the whole *Os Cribroſum*, and all the ſmall Holes being ſtop'd, the *Oſſa Plana* grew ſo high as to extend to the *Septum Narium*; and he conjectures this laſt Accident was the Cauſe of his Gibboſity, ſince the *Pituita* not being diſcharged by the Noſe, muſt neceſſarily lodge it ſelf towards the Spine; and for this Reaſon the *Vertebræ* and their Cartilages, by the conſtant Fluxion of the Humidity, muſt inevitably be relaxed and protruded out, and form this Bunch. All the *Vertebræ* of the Spine, *Os Sacrum*, and *Os Pubis*, being as ſoft as Wax. The Sixth, Seventh, Eighth, and Ninth *Vertebræ* were conſumed by the *Caries*, eſpecially the Three laſt, of which nothing remained beſides the exterior Circle, and the Parts which were miſſing were found in the Lungs.

Of the Fracture *of the Rump-Bone.*

THE Rump Bone is placed at the Extremity of the *Os Sacrum*, and is compoſed of four or five ſmall Bones and two Cartilages joined together, which form a Sort of a Tail crooked inwards. To reduce a Fracture of the Rump-Bone, put the Fore Finger of the Right Hand up into the *Anus*, and then place the Fingers on the outſide on the Fracture, and by the Help of both Fingers put the Bone into its Place. But obſerve here, that this Bone for the moſt Part is rather luxated than fractured. Put up ſomething in Form of a Suppoſitory into the *Anus*, to keep the fractured Bones in their right Place after they are reduced, and lay on a Compreſs wetted with ſome Defenſative Liquor, and keep this on with the Fillet in Form of a T. Let the Patient lie on his Side till the Bone be reunited; and when he begins to ſit, let it be on a Chair with a Hole in the midſt, for Fear of compreſſing the Bones. The Rump-Bone is cartilaginous in the Eighth Month, and the Two Points in its inner Part, whence its Oſſifications begins, do not appear till the Ninth Month.

Of the Fracture *of the* Os Ilium.

IF the *Os Ilium* be broke, and ſome Splinters of it run into the Fleſh, make an Inciſion, and take them out, and ſnip off the Inequalities of the Bone with a Pair of Pincers, or reduce them into their proper Place, if they adhere to the Bone or *Perioſteum*. In making the Inciſion, take Care not to hurt the Veſſels. If there be no Splinters, reduce the Bone in the moſt convenient Manner with your Fingers. Lay a large Compreſs dip'd in ſome good Defenſative on the Bone, and keep it on with the Bandage named *Spica*. This Bone is united in 25 or 30 Days.

H. Ar-

H. Arniſius, in a Letter to *Fab. Hildanus*, extant in his *Cent.* of Epiſtles, tells him, that in diſſecting the Body of a certain Woman after Labour, he found not only a Diviſion of the *Os Pubis*, but the *Oſſa Ilii* likewiſe were ſeparated from the *Os Sacrum*; and he pretends, that the Reaſon why the *German* Anatomiſts cannot find the Bones ſeparated in Women after the Birth, is, becauſe they defer their Execution till the Sixth or Seventh Week after their Delivery. *Hildanus*, in his Reply to the Gentleman, denies that he had ever known the former happen in the moſt difficult Births, and thinks the latter, if true, happens but ſeldom, notwithſtanding his and *Bauhinus*'s Obſervations.

Of *the* Fracture *of the Shoulder-Bone.*

THE Firſt Bone of the Arm is called the *Humerus*, or Shoulder-Bone, and is ſolid, long, and unequal, and has a Head in its upper Extremity, which is covered with a Cartilage, and received into the Head of the Shoulder-Blade. Place the Patient on a Stool, or let him ſit in his Bed, and let one Aſſiſtant take hold of his Arm above the Elbow with both Hands, and another ſtand behind to take hold of the upper Part of it with both Hands, and let both of them draw together, and at the ſame Time let the Surgeon bring the Two Ends of the Bone together, and adjuſt them by compreſſing the Part around with the Palm of his Hand 'till he finds there is no Inequality. If after the Fracture the Two Ends of the Bones continue together, yet a ſlight Extention is neceſſary, for Fear leſt the Surgeon break off any of the *Aſperities* at the End in preſſing them to a Level. After the Bones are reduced, let the Aſſiſtants continue to hold the Arm, extending it a little till the Dreſſing be made, which is to be done with a ſimple Compreſs dip'd in ſome Defenſatives, to prevent the Inflammation from extending it ſelf to the Part. When this is laid on, take a Roller above Two Inches broad, and Two Ells in length, rolled up at one End, and with this make Two circular Turns about the Fracture, and bind the Part ſtrait enough to keep the Bones in their proper Place; then bring up the Roller, aſcending lengthways of the Arm, with little Edgings, which muſt not be altogether ſo ſtrait as the Turns about the Fracture; and when the Roller is ſpent, pin it at the upper End of the Arm. When this is done, take another Roller of the ſame Length and Breadth with the former, and begin to apply it on the Fracture, making three circular Turns about pretty ſtrait; but in this, the Turns of the Roller muſt be made to reduce thoſe Muſcles which the firſt Turn had drawn a little aſide, then bring down the Roller to the Bottom of the Arm, leaving ſmall Edgings, and bring it over the Flexure of the Elbow, but not ſo as to bind the Joint, then bring it up again, leaving little Edgings, and pin it where it ends. After this, you muſt have Four longitudinal Compreſſes of a competent Thickneſs, and almoſt as long as the Part which is hurt, and each of theſe muſt be covered with a Paſtboard, or a very thin Splint. In the next Place take a Roller as before, but ſomething longer, and apply this near the Elbow, and make three circular Turns about the fractured Part, and ſo bring the Roller up to the Top of the Arm, ſtill leaving Edgings; next bring it under the Armpit, and about the Body, and ſo faſten it. Beſides this, you may if you pleaſe lay on Two Paſtboards of an equal Length with the Part, and encompaſs the Arm with theſe, and tie them with Three Ribbons, beginning with that in the Midſt, and in the laſt Place ſuſpend the Arm with a Sling. It is moſt adviſable for the Patient to keep his Bed.

Fab. Hildanus tells us, That a certain Perſon of Threeſcore Years of Age had a Pain in the Articulation of the Right Elbow, for which he uſed no other Remedy beſides keeping his Arm ſtill in Bed; but upon Riſing, and endeavouring to draw on his Glove, he broke his Arm five or ſix Fingers Breadth above the Elbow; and upon removing the Dreſſings about Three Days after, there was found a Second Fracture near the Joint it ſelf; notwithſtanding which, the Patient did poſitively deny that he ever had any Venereal Diſtemper.

Of

Of Fractures *of the Bones of the Hand.*

TO make the Extenſion, let one Aſſiſtant hold the Patient's Arm above the Wriſt, and another by the Fingers, and whilſt both draw it, take Care to reduce the Bones into their Place. If the Fingers only are broke, reduce them ſeparately one after another. If the Bones of the *Carpus* or *Metacarpus* only are broke, lay a Compreſs dip'd in ſome Defenſative on the Fracture, and another pretty thick Compreſs in the Hand, making the Bandage called the *Half Gauntlet*. If the Fingers are fractured, each of them requires a particular Bandage, and muſt be bound ſtrait, almoſt in the ſame Manner as the Arm. If there be no Wound, keep the Dreſſings on till the Reunion be made, unleſs ſome Accident require them to be removed; but if there be any, dreſs it after the Manner practiſed in Contuſions.

Of the Fracture *of the Thigh.*

THere is but one Bone in the Thigh, which is ſomething convex before, and curved behind, and the Artiſt muſt have Regard to this Curvature, becauſe if the Bone ſhould be ſet ſtrait, it would be longer than naturally it ought to be; and the Patient would become lame. As to the Reduction of it, place the Patient on his Back, and let one Aſſiſtant take hold of the Thigh above the Knee, and another graſp its upper Part, and let both theſe at once draw the Part ſtrongly, to bring both Ends of the Bone together; and whilſt they do this, let the Surgeon reduce them, and bring them to a Level. If the Two Ends continue together, yet ſome Sort of Extenſion is neceſſary, for Fear of breaking off the Extremities, and by this Means hinder the Reunion of the Bone.

If the Fracture be near the Head of the Bone, there is no Room to take hold of it, and therefore a Napkin muſt be put between the Patient's Thighs, and one Aſſiſtant muſt draw this, while the other takes hold of the Thigh, a little above the Knee, and ſo makes the Extenſion. If this cannot be conveniently enough done with the Hands, the Surgeon muſt make Uſe of Girths, or, if theſe be not ſtrong enough, of Towels.

Wrap the Fracture round with a large Compreſs dip'd in Wine heated, and lay a good Compreſs three quarters of an Inch thick all along the hollow Part of the Thigh, to preſerve its Curvature; for if it were ſtrait, it would be longer than it ought to be, and the Patient would be lame all his Life-time. The Bandage muſt be made with Three Rollers about Three Inches broad, and rolled up at one End: The Firſt Roller muſt be Three Ells in Length, the Second Four, and the Third Five Ells. In the Hoſpital of *Charity* they uſe Boxes matted within, and by this Means pretend to keep the Leg ſtable and in a good Poſture.

In the *Miſcellanea Curioſ.* there is a Relation, that a Woman of a good Habit of Body, and 5 Months gone with Child, who broke her Thigh, and having Care taken of it without any Succeſs, was at laſt delivered of a ſound Child, and in about a Month after was perfectly cured of her Fracture. *Hildanus* tells us, the Wife of a certain Senator of *Bern* having broke her Leg, could by no Means be cured till ſhe was delivered about 40 Days after. Theſe Obſervations ſhow, that in the Time of Pregnancy Nature imploys moſt of the nutritious Juice in the perfecting of the *Fœtus*.

A particular Caſe of a Luxation *of the* Patella, *and a Fracture of the* Thigh. *By* George Ryley, *Surgeon, at* Namptwich *in* Cheſhire.

'ON the Firſt of *October*, 1709. a Boy 'aged about Fourteen Years falling off 'a Ladder Two Yards high, was taken up, 'and complaining he had hurt his Right 'Knee, was brought to me. Upon examining it, I found the *Patella* luxated, and 'a conſiderable Contuſion upon the Parts 'adjacent. I immediately reduced the *Patella*, and embrocated the Knee with *Ung. Dialth. cum Ol. Hyperic. malax.* as an Anodyne, becauſe the Pain was ſtill violent, 'and with *Ceratum e Bolo*, and a contentive

'Bandage bound up the Limb. The Pain 'being a little appeaſed, I ſuſpected the 'Thigh might be hurt, and therefore exa- 'mined him how he felt it: He anſwered, 'it was entirely eaſie; and both he and his 'Friends were loth his Breeches ſhould be 'drawn off and on again, which would be 'conſiderable Trouble to him when there 'was no Complaint of that Part, therefore 'for this Time I diſmiſſed him.

'On the Third Day following he came 'to me again, riding ſingle on Horſeback, 'and ſaid, the Pain in his Knee continued, 'but not quite ſo violent. I took off the 'Bandage and Dreſſings, and found the 'Knee and Thigh very much tumefied, but 'the *Patella* right. The Breeches had never 'been off yet, and now were ſo well and 'equally fill'd by the ſwell'd Thigh, that 'they kept it very ſteady; and therefore, 'conſidering how neceſſary the Steadineſs 'would be to him, ſince he had near Two 'Miles to ride home again, I deferred exa- 'mining the Thigh till I ſaw him in Bed at 'home, which I promiſed to do the Sixth. 'In the mean Time I prepared for the Con- 'tuſion, which now appeared more evident, 'a *Totus, e Decoctione Sumitat. Abſinth. Cen- 'taur. Rad. Lil. Alb. Fol. Chamom. &c.* with 'which I fomented the Joint very hot, and 'embrocated it with *Spir. Vin. Camphorat.* 'and applying the ſame *Cerate* and Bandage 'again, diſmiſs'd him.

'On the Sixth I viſited him, and having 'his Breeches rip'd off, I handled the Thigh, 'and found a *tranſverſe Fracture* about the 'Middle of the *Os Femoris*, I immediately 'prepared to reduce it, and having got '*Splints, Rollers, Junks, &c.* ready, I per- 'formed the Operation without the leaſt 'Pain to the Patient, and with a very ſmall 'Extenſion.

'In Two or Three Days afterwards the 'Swelling fell, and ſo obliged me to take 'off the Bandage, which I did to ſtreighten 'it. In about a Fortnight's Time the Pain 'in his Knee ceaſed, and he grew well 'apace. The 18th I opened the Thigh, and 'found the *Callus* ſo much grown, as to 'appear rather too high, which with a little 'lighter Bandage and a Paſtboard Compreſs 'upon the Part, was taken down at the next 'Opening, which was the Second of *No-* '*vember*, but the Tightneſs of the Bandage 'had raiſed the Tumour of the Knee again; 'by ſlackening of which, that alſo went 'down in Two or Three Days. I then re- 'newed the Cerate, and got him up, ſetting 'him with his Leg before him on a Stool, 'and a Support under the fractured Part. 'The Eleventh of *November* he ſet his Foot 'to the Ground, when renewing the *Cere-* '*cloth* once more, he was perfectly well in 'another Week. This Leg was nothing 'ſhorter than the other all the Time, ſo 'even were the Edges of the Bone ſet and 'kept together. But that which I chiefly 'reckon worth remarking in the Caſe is, 'that during the whole Cure, as well as 'before the Reduction of the fractured 'Bone, the Boy had not the leaſt Senſe of 'Pain, except what was in the Knee, which 'the Luxation of the *Patella*, and Contuſion 'there, is very ſufficient to account for.

'It is remarkable, that the Fracture hap- 'pened at ſuch a convenient Diſtance from 'the Joint, that the Ends of the Bone 'could not by their Preſſure upon the *Ten-* '*dons* excite a Senſe of Pain; and whether 'this might not be one Cauſe of the Pa- 'tient's Freedom from Pain, I think worthy 'Enquiry.

'But then that the *Perioſteum* ſhould un- 'dergo a Laceration, which ſeems inſepara- 'ble from any Fracture, and yet not tranſmit 'to the Patient any Senſe of Pain, is to me 'inſoluble, without diveſting it of that 'acute Inſenſibility which we all ſuppoſe 'Nature has endowed it with. But theſe 'nicer Enquiries I am leſs concerned about: 'It was ſufficient to me that the Boy was 'well cured; and if this may ſerve to 'make others more inquiſitive to find out '*Fractures* for the Future, it will be of 'general Uſe to the Publick, and Credit to 'the Profeſſion; and thereby I ſhall fully 'obtain the End of writing this ſhort *Ephe-* '*meris*.

Namptwich in *Cheſhire, September* 13. 1710.

GEO. RYLEY.

Of

Of the Fracture of the Rotula.

IF the *Rotula* be fractured tranſverſely, the upper Part will be drawn up; and therefore to reduce it, place the Patient on his Back, and let ſome Aſſiſtants extend the Leg, and then bring down the Bone, and with your Thumbs adjuſt it to that which remains below: And here obſerve never to take off both Thumbs together, for then the Piece will infallibly fly out of its Place.

If the *Rotula* be fractured lengthways, there is no Need of making an Extenſion, becauſe the Bones do not ſtart far from one another, and it ſuffices to thruſt them into their Place, and then make the Dreſſing. If the Fracture be tranſverſe, take a Roller of Three Ells long, and about an Inch and a half broad, roll'd up at both Ends: Apply the Middle of this Roller above the *Rotula*, and make Two circular Turns; then bring it down under the Ham, and croſs it there; then bring it beneath the *Rotula*, and make a circular Turn; next bring it up, and let it croſs again below the Knee; then bring it up, and make a circular Turn there, and continue thus bringing it up and down, and croſſing under the Knee, and making circular Turns above and below, till the Joint be covered with the Edgings, and then pin the End of the Roller either above or below the Knee. When this is done, lay the Leg in the Junks prepared for that Purpoſe.

If the *Rotula* be fractured lengthways, take a Roller of about Three Ells long, and Two Inches broad, roll'd up at both Ends, and having a Slit in the Midſt. Apply the Middle of this on the Middle of the Fracture, and paſs one of the Heads of the Roller through the Slit in the Middle, ſo that this Slit be in the Middle of the *Rotula*; then draw the Roller pretty ſtreight, to keep the Parts of the Bone together, and cover the *Rotula* with ſeveral Circumvolutions, leaving all along ſmall Edgings; and laſtly, keep all ſteady by ſeveral circular Turns about the *Rotula*: And when this is done, lay the Legs in the Junks. Embrocate the contiguous Parts with good Defenſatives, and do not remove the Bandage till the Cure be perfected.

Fab. Hildanus, Cent. 5. *Obſ.* 88. relates, That a certain luſty Fellow, of 40 Years of Age, had a tranſverſe Fracture of the *Rotula*, with a great Contuſion, but no Wound. Though the Patient was treated according to the Rules of Art from the very firſt, yet nevertheleſs he was afflicted with great Pains, and ſeveral other bad Symptoms; and after theſe were removed, and the Cure at length compleated, he continued lame; his Thigh was very weak; he could not walk without a great deal of Trouble; and had the greateſt Difficulty in the World to lift up his Leg in going up any Aſcent.

Of a complicate Fracture of the Leg.

THere are Two Bones of the Leg, the *Tibia*, or larger Focil, and the *Fibula*, or leſſer; either of which, or both, are to be thus reduced when broke: Place the Patient on his Back, and let an Aſſiſtant take hold of his Leg above the Foot, and another below the Knee. If both Bones are broke, and ride one over the other, let them make a ſtrong Extenſion; which is not required to be ſo great if one of the Bones remain entire, and then with both Hands bring the Bones even.

When the Bones are reduced, dreſs this like other contus'd Wounds, applying Pledgits, with good Digeſtives, and laying on a Plaiſter, and a ſimple Compreſs over that, wetted in Wine heated. When the Wound is dreſs'd in this Manner, bind up the Part with the Eighteen-Tail'd Bandage.

When Things are thus prepared, apply the Tails of the ſaid Bandage on the *Fracture*, raiſing them one on one Side, and the other on the other, and croſſing them, and ſo continue to raiſe the Heads of the Firſt Range; next lay Two Compreſſes on each Side the Leg as long as it ſelf; then proceed to raiſe, and croſs the Second in the ſame Manner as the Firſt, beginning with thoſe that lie over the *Fracture*; and in the laſt Place do the ſame with the Third Rank, and make the remaining Part of the Dreſſing with Junks, Splints, Bolſters, Soals, Pillows, and Ribands. Dreſs the Fracture twice a Day, and take Care to cover the Bone, if it lies bare, with dry Pledgits, not

ſuffering the Wound to cloſe till the Bone be exfoliated.

Of a Fracture of the Bones of the Feet.

LET the Patient be placed on a Stool, or on a Bed, and if the *Tarſus* or *Metatarſus* be fractured, let Two Aſſiſtants make the Extenſions, one having Hold of the End of the Foot, and the other of the Heel and the lower Part of the Leg, and then reduce the Bones. The Toes are to be managed in the ſame Manner as the Fingers of the Hand. Since there is always a Wound in a Fracture of the Foot, it muſt therefore be dreſs'd like other contuſed Wounds, that is, digeſted not with greaſy Unguents, which are apt to rot the Tendons, but Spirituous Applications, as Oil of Eggs, Oil of Turpentine, *&c.* Firſt lay on Pledgits, and then a ſimple Compreſs round the Foot, dipp'd in ſome defenſative Liquor: And laſtly make the following Bandage:

Take a Roller between Two and Three Ells long, and an Inch and a half broad, roll'd up at both Ends. Begin with making a Circumvolution about the Bottom of the Leg, and then croſs on the Bottom of the Foot; then bring it under the Foot, and croſs again, and return over the Foot croſſing, and proceed to the End of the Foot in the ſame Manner. Theſe Turns of the Roller leave Lozenge-like Spaces, which has occaſioned this Bandage to have that Name given it. From the End of the Foot return to the Heel, bringing the Roller up, and covering the Foot with the Edgings, and then faſten by ſeveral Circumvolutions about the Leg. After the Bandage is made, lay the Leg in the Junks.

Hildanus relates, That a certain Perſon attempting to leap over a Ditch when the Ground was frozen, wrenched his Foot ſo violently, as to force the *Talus* and *Aſtralagus* out of their Place, and broke the Ligaments which bound the Bones together, which forced him to take off the Foot.

I ſhall paſs by ſaying any Thing of *Luxations* in General in this Place, becauſe enough has been ſaid of that Subject already, and proceed, as I have done from the ſame Authors with Fractures.

Of the Luxation of the Bones of the Cranium.

THis is bringing the Bones together by compreſſing them with the Palm of the Hand, and then keeping them together by ſome convenient Bandage. Cut off the Patient's Hair, and lay a Compreſs dipp'd in Spirit of Wine, or ſome other diſcutient and ſpirituous Liquor, and make the Bandage call'd the *Capeline* to bring the Bones together by Degrees.

Soak the Dreſſings every Day in *Red Wine*, Spirit of Wine, or ſome ſuch ſpirituous and reſolvent Liquor, to promote the Tranſpiration of the watry Matter; and let the Patient uſe a drying Diet, keeping his Spirits up, and now and then purging with *Hydragogues*. When the Bandage ſeems to ſlacken, from the Bones approaching to each other, it is Time to undo it, and bind the Part up again. This is a Diſtemper of the Part that rarely happens. However, *Hildanus* tells us, that a robuſt Fellow of 40 Years of Age, who never had been ill, was ſeized with a continual Fever. In the Beginning he neglected all Methods of Cure, which prov'd of ill Conſequence to him, depriving him of Sleep, and throwing him into a *Delirium*.

Upon the Sixth or Seventh Day the Coronal and Sagittal Suture ſeparated, and the Motion of the Brain might be felt by laying ones Finger on the Interſtice of the Sutures. Upon the Seventh Day the Patient had a profuſe critical Sweat, tinctured like the Ruſt of Iron, by which the morbifick Matter was thrown out, and by Degrees the Sutures reunited, and the Patient recovered.

Of the Luxation of the Bones of the Noſe.

THis Diſlocation ſeldom happens, the Bones of the Noſe and the Coronal Bone being very firmly united; and when it does, it muſt be reduced in the following Manner:

Manner: Take a ſmall Stick of Fir, of a proper Size, plain'd and fitted to the Noſtrils, and wrapp'd round with Tow, and then placing the Thumb on the Root of the Noſe, partly on the Coronal and partly on the Naſal Bone, to keep the Bones ſteady, put them into their Place with the Stick Tow. In putting the Stick up, you muſt take Care not to hurt the ſpongy Bones of the Noſe, for fear of wounding the Part, and cauſing ill condition'd Ulcers. The Dreſſing is the ſame as in Fractures of the Noſe. If there be a Wound, dreſs it once every Day as a complicate Wound.

Of the Luxation of the Lower Jaw.

IF the Bone has been out for any Time, emollient Remedies muſt be uſed before it can be reſtored. To reduce a compleat Luxation, when both Heads of the Bone are out, let the Patient ſit upon the Floor or low Stool, and place a Servant behind to ſupport and keep his Head ſteady, and then put both your Thumbs into the Patient's Mouth, having wrapp'd them round with a Tape to defend them from being hurt by the Patient's Teeth, and to hinder them from ſlipping when you preſs on the Lower Jaw; then clap your other Fingers under the Patient's Chin, to draw the Jaw, and raiſe it up.

But if the Mouth be ſo cloſe, that you cannot thruſt your Thumbs in, put a ſmall wooden Wedge, about an Inch thick, and introducing theſe Wedges ſtrongly by their thinner End, keep them on the Teeth. In the laſt Place put a Girth under the Chin, and let a Servant put both his Knees on the Patient's Shoulders, and draw the Ends of the Girth, whilſt you muſt thruſt down the Wedges, to bring the Jaw into its Place.

When it is only diſlocated on one Side, place the Patient on a low Stool, and let a Servant ſtand behind to keep his Head ſteady; then put your Thumb on the Grinders of that Side which is diſlocated, and thruſt the Jaw down, and reduce it into its Place. The Mandible may be reduced ſometimes by a Blow of the Fiſt only, on that Side which is not luxated; but this can only take Place when the Luxation is uncompleat. The Dreſſing is the ſame as in a Fracture of the Jaw.

Of the Luxation of the Clavicle.

WHen the *Clavicle* is diſlocated, the Patient cannot lift up his Arm without a great deal of Difficulty. The *Acromion* cauſes a Jetting out, and there is a Cavity caus'd by the Clavicle's Falling down. This Accident is hard to be remedied in ancient Bodies, becauſe the Ligaments are grown hard and bony, and are very difficultly conſolidated when once they are broken. To remedy this Accident, you muſt lay the Patient on his Back, and put ſome hard convex Body between his Shoulder-Blades; then preſs his Shoulders and the Side of his Breaſt, and in the mean Time reduce the bone into its Place. The Dreſſing is the ſame as in a Fracture of the Part. The Patient ought to keep his Bed, and let Blood, or take a Clyſter, as Occaſion requires.

Of the Luxation of the Vertebræ.

TO reduce the *Vertebræ* of the Neck, of whatever Kind the Luxation be, let the Patient be placed on a low Chair, and let a Servant lay a great Streſs on his Shoulders, and while he does this, take Hold of the Patient's Head under the Ears, and making an Extenſion of it, turn it to and fro till it be reduced; and you may know that it is ſo by his being able to turn it himſelf, and the Ceſſation of the Pain.

To reduce the *Vertebræ* which are luxated externally, let the Patient be laid on a Table on his Belly, and faſten a Girth under his Armpits, and on the Hips, and tie at the ſame Time his Thighs and Legs, and draw both above and below, without making ſo violent an Extenſion, and in the mean Time reduce the Part.

If the *Vertebræ* cannot be reduced in this Manner, take Two Sticks near a Finger's Breadth in Thickneſs, and about Four or Five Times as long, and wrap theſe in a Cloth, for fear of hurting the Patient; then lay one of theſe Sticks on each Side the diſlocated Part, and make a great Preſſure on them, to thruſt in the *Vertebræ*: Or take

take a great Roller of Wood, ſuch as the Paſtry-Cooks uſe, and roll it to and fro on the Two Sticks. Note here, that the Two Sticks which are on the Side be higher than the Spinal Proceſſes of the *Vertebræ*, to prevent all Danger of breaking it. You may conclude the *Vertebra* is reduced, if it be equal with the contiguous ones.

Though the Luxation of the *Vertebræ* inwardly be almoſt impoſſible to reduce, and moſt commonly is mortal, you muſt not nevertheleſs abandon the Patient; and therefore when this happens, place the Patient on his Back, and make an Extenſion with Pullies, and then manage the *Spine*, and try to bring in the *Vertebræ*. If this fails, make an Inciſion on the *Vertebra* which is depreſs'd, juſt over its Spinal Proceſs, and take Hold of it by this, and endeavour to reduce it in that Manner. If the Rump-Bone be thruſt in by any Blow or Fall, put the Fore-Finger of the Right Hand into the *Anus*, and puſhing it up with the Left Hand, preſs it out, and guide it into its Place. If the Luxation be external, which ſometimes happens in violent Labours, put the Bone gently in with the Fingers. Theſe Bones are confirmed in 3 Weeks.

Hildanus relates, That a certain Man having a Luxation of Two *Vertebræ*, was paralytick from the Navel to the Feet. A Countryman happening to fall from a Tree, had the Second *Vertebra* of the Loins luxated inwards: Upon which he felt a great Pain, which continued for a long Time, and he vomited his Meat before Digeſtion, and continued in this Condition ſeveral Days, without being able to retain any Thing in his Stomach. After ſome ſhort Space he was ſeized with a Burning Fever, an unextinguiſhable Thirſt, Want of Sleep, Reſtleſneſs, with a Dryneſs of Tongue, and a *Delirium*, all the Parts below the Navel became paralytick, and he could neither retain his Urine nor his Excrements.

Of the Luxation of the Ribs, and the Cartilago Mucronata.

WHen a Rib is luxated outwards, lay the Patient's Arm over a Door, to ſuſpend the Body, and thruſt the Riſing of Rib into its Place. If the Rib be luxated inwards, you muſt make an Inciſion to bring it outwards. When the Mucronated Cartilage is depreſs'd, lay the Patient on his Back upon ſome convex Body, and then preſs both Sides of the Breaſt with the Hands to raiſe the Cartilage. If this fails, apply dry Cupping-Glaſſes on it to raiſe it. Before you attempt to reduce it, chaff the Part very well with Oils of *Caſtor*, *Turpentine*, and ſuch-like ſpirituous Topicks.

The Dreſſing in Luxations is the ſame as in Fractures of the Ribs. When the Mucronated Cartilage is reduced, lay on ſomething proper to ſtrengthen it. *Ambroſe Parry* uſes this Compoſition:

Rs. Root of *Biſtort*, *Drachm.* j. *Cypreſs-Nuts*, *Drachm.* j. *Maſtich*, *Frankincenſe*, *ana Drachm.* jſs. *Balauſtiary*, *Scrup.* j. Oil of *Walnuts*, *Drachm.* jſs. *Pitch* and *Turpentine*, as much as will reduce theſe Ingredients to the Conſiſtence of an Emplaſter.

Bartholin relates, that a certain young Man having a Looſeneſs, had the lower Ribs on the Right Side luxated in ſuch a Manner, as to be ſeen and felt. All the Means that his Surgeons could think on prov'd ineffectual: His Strength decayed; he had a ſingring Fever. After ſome Time there aroſe a ſmall Puſtule, which ſeparated, and broke; upon which the luxated Ribs returned to their Place, the Ulcer was cured, and the young Man did well.

Of the Luxation of the Humerus, *or* Shoulder-Bone.

THE Luxation of the Shoulder may be reduced in Six ſeveral Manners, *viz.* by the Fiſt, by the Shoulder placed under the Patient's Armpit, by a Ball of Thread thruſt by the Heel, by a Ball on a Leaver, by the Ladder, and laſtly by the Amby.

To reduce a Shoulder by the Help of the Fiſt clinch'd, lay the Patient on a Table on that Side which is oppoſite to the Light, and let one Servant put a Girth under his Armpit, and another a Second above the Elbow. Let him who holds the Girth which paſſes under the Armpit keep it firm, and let him who has Hold of that above the Elbow, draw it till the Head of the Bon

be directly againſt the Socket, and then put it into its Cavity with your Hands or Fiſt. If the Hands are not ſufficient, you may make uſe of Pullies.

To reduce a Shoulder with the Heel, lay the Patient on the Ground on a Coverlet or Quilt, and then put a Ball of Thread under his Armpits, and do you ſit oppoſite to the Patient, directly againſt the luxated Arm, and if it be the Foot, place the Heel of the Right, and if it be the Left, the Heel of the Left Foot on the Ball; then take the Patient's Arm with both Hands, and draw it towards the Feet, and thruſt the Ball ſtrongly againſt the Armpit. In the mean Time let a Servant ſtand behind the Patient's Head, and draw the Head of the *Humerus* with a Napkin, or any other Girth, and put the Sole of his Foot on the Patient's Shoulder, and thruſt it down, and let another Servant be placed behind, to keep his Body ſteady.

To reduce a Shoulder by the Help of the Shoulder of another Perſon, place the Patient's Armpit on the acute End of the Shoulder of a luſty Man, who is taller than the Patient, that ſo he may keep him ſuſpended, the Man who holds him keeping his Hand to his Breaſt, and while this is doing, put the Head of the *Humerus* into its Cavity. If the Patient be very light, and the Weight of his Body be not ſufficient to reduce his Shoulder, let ſome Perſon or other hang on his Shoulder. If the Patient be ſo tall, that it is difficult to find a Man of a higher Stature, let the Man ſtand on ſome ſmall Stool.

Some reduce this Joint by Means of a *Lever*, others uſe a *Ladder*, or Door, obſerving the ſame Circumſtances; or the *Amby* of *Hippocrates*, known among the Surgeons by the Name of the *Commander*. To reduce the diſlocated Arm with this Inſtrument, you muſt place the Patient on a low Stool, ſomewhat lower than the Machine, with his Feet tied together, for fear he riſes when the Part ought to be reduced. The Patient's Arm muſt be laid all along this moveable Branch, the leſſer End of it being applied under the Patient's Armpit, and tied in Two or Three Places; and when this is done, depreſs the lower End, and this will bring the Head of the Bone into its Place.

When the *Humerus* is reduced, put a ſmall Ball of Lint under the Armpit, to fill the Cavity, and keep this Ball on with a Compreſs cleft at both Ends, which you muſt bring up, and croſs on the Shoulder; beſides this, you muſt lay a Compreſs on the other Armpit, for fear leſt the Compreſs hurts it, and make the Bandage call'd *Spica*, with a Roller Five Ells in Length, and Three Inches broad, roll'd up at one End.

Let the Patient keep his Arm in a Sling, the *Cubit* making a right Angle with the Arm, and reſting on the Ribs. The Dreſſing muſt not be taken off the Firſt Four or Five Days, unleſs ſome Accident happens.

Fab. Hildanus tells us, That a Child of Eight Years old, of a good Habit of Body, had his Right Arm diſlocated by a Fall, which mightily emaciated and waſted him; and this was the more remarkable, becauſe that leſſened while the other Parts grew larger. At length his Relations perceived a Coalition in the bending of his Arm, which hinder'd him from extending it, and it continued bent like a crooked Stick, without putting him to any Pain.

Of the Luxation of the Elbow.

IF the Luxation be inwards, let ſeveral Servants make an Extenſion of the *Humerus* and Arm, and in the mean Time bend the Arm, and bring the Hand to the Shoulder. There are many Practitioners who lay a Ball on the Flexure of the Joint, and then bend the Arm preſently, bringing it to the Shoulder.

If the Cubit be luxated outwards, let the Arm be drawn above and below, and during theſe Extenſions, put the *Olecranon* into its Cavity. In reducing this Luxation, you muſt not bend the Arm as in the former Caſe, becauſe a Motion of this Kind would hinder its Reduction.

For your Dreſſing, lay a ſimple Compreſs dip'd in ſome Defenſative Liquor, to take off the Inflammation. This Compreſs muſt be ſlip'd lengthways, for the better applying it on the Juncture; and when it is on, make a Bandage with a Roller Five Ells long,

long, and an Inch and half broad. In doing this, firſt make a circular Turn on the lower Part of the *Humerus*, then deſcend obliquely in the Bending of the Arm, and make a circular Turn on the upper Part of the Arm, and an X on the Flexure of the Elbow, and thus continue to aſcend and deſcend, making Edgings on the Elbow, and X's on the Bending of the Joint, till the Elbow be quite covered; and when this is done, aſcend up the Arm, and faſten the Roller about the Breaſt.

Put the Arm in a Sling, in the ſame Manner as was deſcribed in the Fracture of this Part, and often make a Pronation and Supination of his Arm, for fear leſt the Bones cement together.

Of the Luxation of the Bones of the Wriſt.

IF the Luxation be inwards, lay the Back of the Patient's Hand on a Table, and while the Extenſion is making, preſs the prominent Bone into its Place with the Palm of your Hand. If the Luxation be outwardly, lay the Flat of the Patient's Hand, and proceed as before. If the Luxation be on one Side when the Extenſion is made, twiſt the Bones on the Side oppoſite to the Diſlocation, and draw each Finger ſeparately, that ſo the Tendons may come into their Place.

If the Bones of the Wriſt are ſlip'd into the Hand, lay the Back of the Hand on a Table, and preſs the Bones into their Place. If they are ſlip'd on one Side, preſs them to the oppoſite.

The *Metacarpus* is compoſed of Four Bones: The Two Middle of theſe cannot be diſlocated on one Side, becauſe they are ſupported by the Two Bones which are on each Side. That which ſuſtains the Fore-Finger, and that which ſuſtains the Little One, cannot be diſlocated towards the Fore-Finger, nor that which ſuſtains the Little-Finger towards the Middle-Finger. All the other Bones may be luxated inwards or outwards; but ſince the Manner of reducing them is the ſame as with that of the *Carpus*, I ſhall remit the Reader thither.

The Fingers may be diſlocated inwards, outwards, or on one Side. To reduce them, there is nothing farther neceſſary than to pull them, and put the Head of the Bone into its Place. In theſe Diſlocations, the Parts recover their natural Tone in Twelve Days, and the Dreſſing is the ſame as taught before.

Of the Luxation of the Thigh.

TO reduce a Luxation inwards, lay the Patient with his Back on a Table, and put into the Table a Pin about Two Foot long, and put this between the Patient's Legs near the Groin; then faſten one Girth under the Juncture of the Thigh, and another above the Patient's Knee, and with theſe let the Extenſion be made. In the mean time put the Head of the Bone into the *Acetabulum*. When the Head of the Bone is drawn enough, let the Aſſiſtants who make the Extenſion ſlacken a little, for the more eaſie reducing the Head of the Bone; and this is to be obſerved in all Reductions whatever.

If the Thigh be luxated outwards, let the Patient lie on his Belly, and make an Extenſion with Girths, and thruſt the Thigh inwards, to bring the Head of the Bone into the Cavity. If the Luxation be forwards, lay the Patient on the oppoſite Side, and make the Extenſions as before; and when this is done, put the Head of the Bone into its Cavity with a Tennis-Ball, and puſh this with the Hand, or with the Knee, for the greater Force, and bring the luxated Leg to the other.

If the Luxation be backwards, place the Patient on his Belly, as in a Luxation outwards, and let the Extenſion be made in the ſame Manner; then take the Patient's Knee, and draw it outwards, to bring the Head of the Bone into the *Acetabulum*.

When the Ligaments of the Thigh are relaxed, the Extenſion muſt not be ſtrong; for it is plain this is both uſeful and hurtful; and a prudent Surgeon muſt always conſider the Nature of the Luxation before the Extenſion be made. The Bandage muſt be the *Spica*.

Let

Let the Patient refrain from all cold, moiſt, and phlegmatick Meats, and uſe a ſtrengthening Diet, and drink *Ptiſans* aromatized with *Roſemary*, *Sage*, *Marjoram*. Chaſe the neighbouring Parts with Oils of *Dill*, *Chamomile*, and *White Lillies*; and becauſe the Patient leads a ſedentary Life, and there is apt to be a Congeſtion of Humours in the Part, purge his Body at convenient Times with Lenitives, and if you ſhould now and then give him a Vomit, it would not be amiſs.

As for local Applications, take a Bag of Leaves, and Flowers of *Betony*, *Sage*, *Roſemary*, *Primroſe*, *Lavender*, *Origanum*, *Wormwood*, of each one Handful; *Roſes*, *Juniper-Berries*, *Oak-Moſs*, of each two Handfuls; Aniſeeds, Two Ounces. Boil theſe with a Handful of Salt, and apply it round the luxated Part. Do this once every three or four Days and rub it, together with the contiguous Parts, with Juice of *Earth-Worms*.

Of the Luxation *of the Knee.*

IT ſeldom happens that the Leg is luxated forwards, becauſe the Tendons of the Muſcles of the Leg keep the *Tibia* ſtrait; and when ſuch a Diſlocation happens, thoſe Tendons muſt be lacerated, or exceedingly relaxed. When the *Tibia* is luxated backward, the *Condyls* are in the Cavity of the Arm, and the Leg is bent. When the *Tibia* is luxated on one Side, there is a Riſing on that Side, and a Depreſſion on the oppoſite. If the Condyl be ſlip'd inwards, there is a Riſing within, and a Depreſſion outwards, and the Leg is turned outwards; and directly the contrary happens when it is luxated inwards. The *Tibia* is eaſily luxated, becauſe its Articulation is not very ſtrait, the Condyls of the *Tibia* jet out, and the *Sinus's* are ſhallow.

To reduce the *Luxation* when the Head of the Bone is ſlip'd backwards, place the Patient on a low Stool, or Bench of a midling Height, with his Back turned towards you; then put his Leg between yours, and bend it with both Hands towards the Patient's Buttocks: Or let the Patient lie on his Belly, and take a *Coulſtaff* with a Bunch or Ball in the Midſt, let an Aſſiſtant put this on the bending of the Ham, and on the End of the Bone which jets out, and let another put a Girth ſomething more than two Inches broad, and in the mean Time bend it forcibly againſt the Buttock.

If the *Diſlocation* be forwards, let the Patient lie on his Back, and put one Girth above the Knee, and another above the Juncture of the Foot, and put the Knee into its Place with your Hands, or a *Coulſtaff* with a Bunch in the midſt. If your Hands are not ſtrong enough, you may make uſe of Pullies.

When the Leg is well reduced, the Patient can bend, or extend or make uſe of it in any Manner without Pain. If the *Tibia* be luxated on one Side, when the Extenſion is made, bring the Head of the Bone into its Place with your Hands, or a *Coulſtaff* as before. If the leſſer *Focil* be luxated in its upper Part, you may thruſt it into its Place with your Hand. In theſe Diſlocations the Dreſſing is the ſame as in a *Fracture* of the *Rotula*.

Of the Luxation *of the Bones of the Feet.*

IF the *Tibia* and the leſſer *Focil* are ſeparated, put them into their Place with your Hand in the beſt Manner that you can. You may reduce the *Aſtragalus* by drawing and forcibly thruſting the Foot to that Part oppoſite to that from whence it ſlip'd. If the Bones of the *Tarſus* are ſlip'd upwards, let the Patient ſet his Foot on a Table or a Floor, and then thruſt the Bones into their Place. If the Prominence be below, or on one Side, you muſt in the ſame Manner thruſt the Bone into its Place. If the Bones of the Toes are diſlocated, they muſt be reduced in the ſame Manner as all the other Bones, after a due Extenſion made. Upon the whole Matter, in theſe and the like Caſes, good Senſe, with a competent Experience, goes further than all the Inſtructions that can be delivered in Writing.

The *Tarſus*, *Metatarſus*, and Toes, are cartilaginous in a *Fœtus* in the Womb on the Third Month, and about that Time the *Metatarſus* is oſſified. In the Fourth Month the Bones of the *Metatarſus* are entirely

formed, and the Oſſification of the Bones of the *Tarſus* begins to appear by ſeveral ſmall bloody Spots. In the ſame Month the upper and lower Junctures of the Toes of the Foot are diſtinguiſhed by ſeveral white Spots, and thoſe in the Middle are cartilaginous.

In the Fifth and Sixth Month, the Second Rank which is next the Thumb is oſſified. In the Seventh and Eighth Month, the Two Fingers next the Thumb are oſſified in the middle. In the Ninth Month, the reſt of the Fingers are perfected. From the Fourth to the Ninth Month, the Bones of the Feet gradually increaſe. In the Eighth Month the *Calcaneum* grows bony, and in the ſame Month the *Aſtragalus* is bony likewiſe, and there appears a Diviſion in the *Tarſus*; but in the Ninth Month the Junctures are very apparent.

Hildanus, Cent. 2. *Obſ.* 67. relates, that a robuſt Fellow leaping over a Ditch, wrench'd his Leg in that violent Manner, that he burſt the Ligaments together with the Skin, and the *Aſtragalus* was diſlocated, which the Surgeon perceiving to hang by ſome Fibres only, he took it off.

An Explanation of the following Numbers, which contain the Compound Bandages, Sutures, and ſome other Machines made uſe of in Fractures, Luxations, &c.

N° I.

Repreſents a Roller with one Head, or rolled up at one Head only.

N° II.

A double-headed Roller.

N° III.

A Triangular Emplaſter to be laid on the Noſe. The Paſtboards applied on the Side of the Noſe when it is fractured or luxated, muſt have the ſame Fi-

N° IV.

Is the Compreſs and Paſtboard which is to be applied on the lower Jaw when there is a Fracture and Luxation on one Side only; and this Compreſs muſt be ſtitched to a Paſtboard.

N° V.

Is the Compreſs and Paſtboard to be applied when there is a Fracture or Luxation on both.

N° VI.

The Bandage of *Heliodorus* for one Breaſt.

N° VII.

Heliodorus's Bandage for both Breaſts.

N° VIII.

The Emplaſter, Paſtboard, and Compreſs for the *Sternum*. This is called *Scutum*.

N° IX.

The Compreſs and Paſtboard for a Fracture of the Ribs.

N° X.

An Emplaſter and Compreſs for the Joints, as the Arm or Leg.

N° XI.

An Emplaſter and Compreſs for the *Metacarpus*.

N° XII.

Is the Bandage with 18 Tails, for complicate Fractures.

N° XIII.

Junks for the Leg and Thigh in compound Fractures.

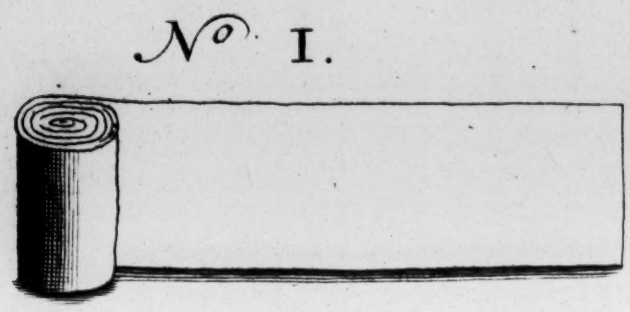
N° XIV.

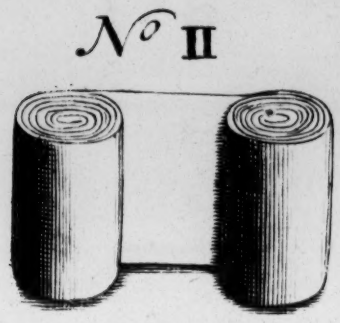
A Paſtboard to keep the Foot ſtrait.

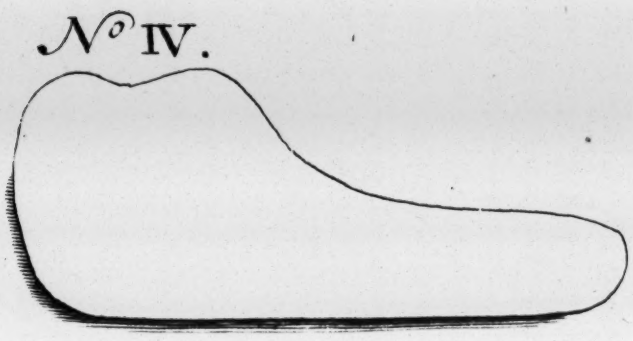
N° XV.

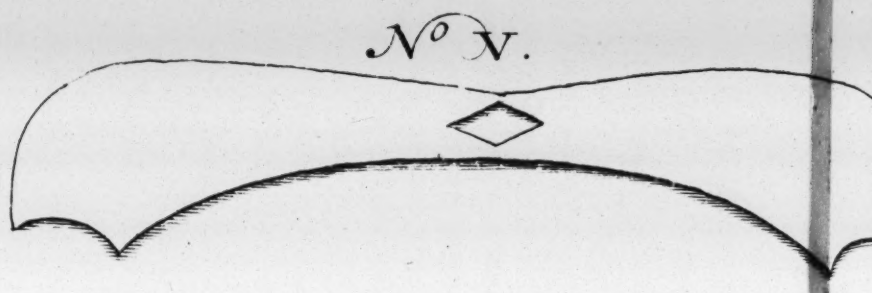
A ſmall Quilt ſtitched to the Paſtboard for the Eaſe of the Foot.

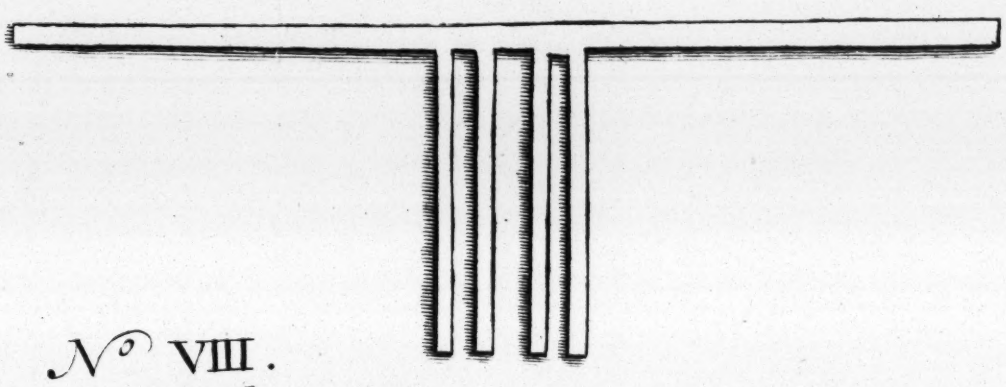
N° XVI.

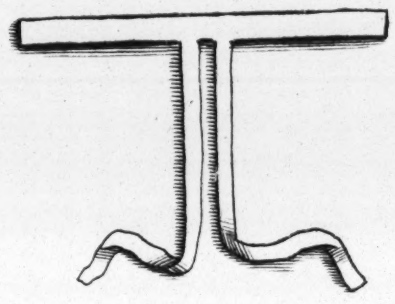


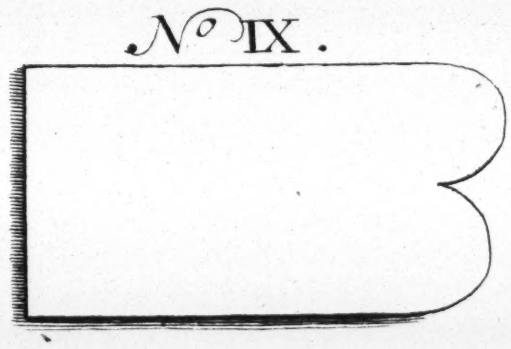


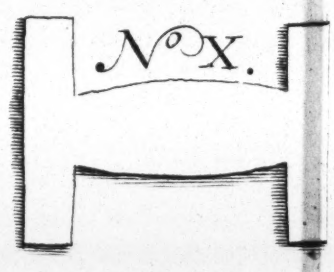


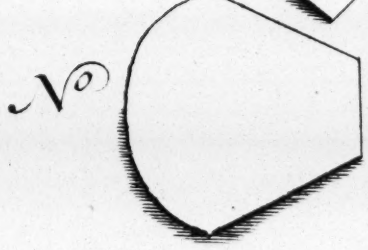


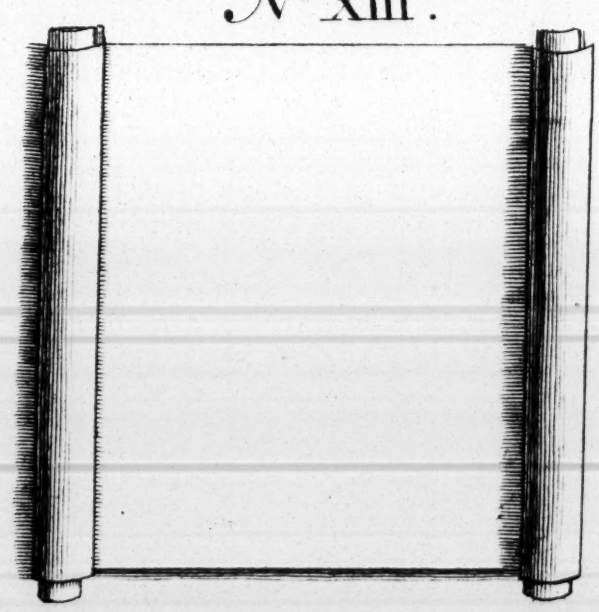


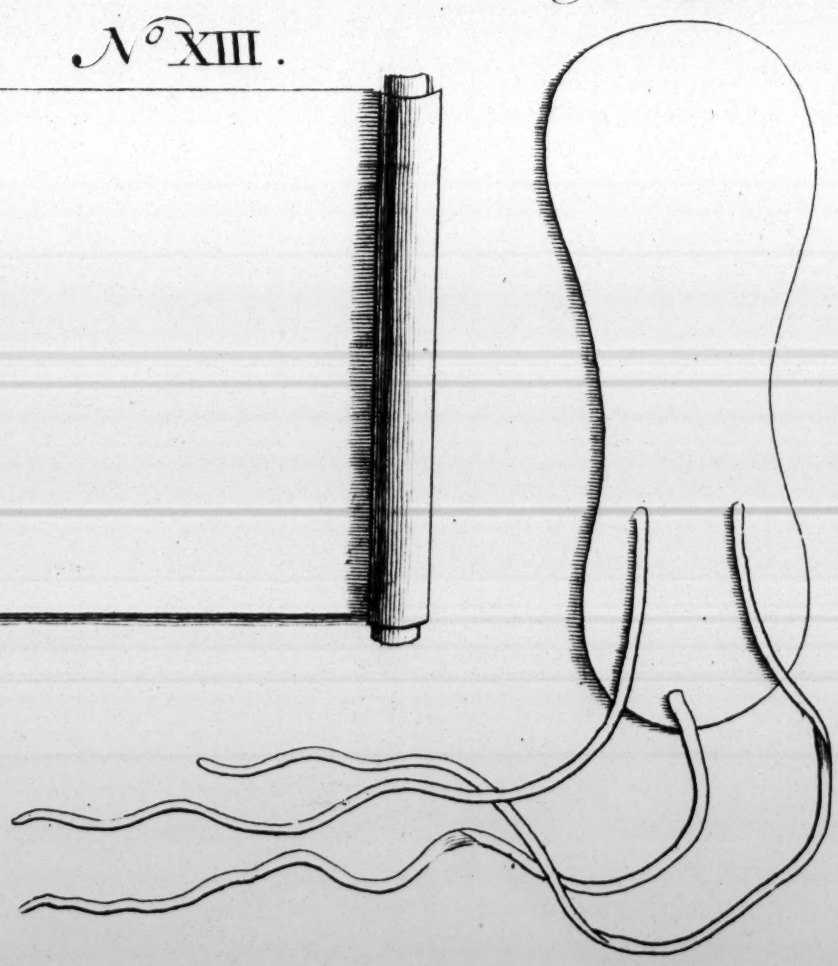


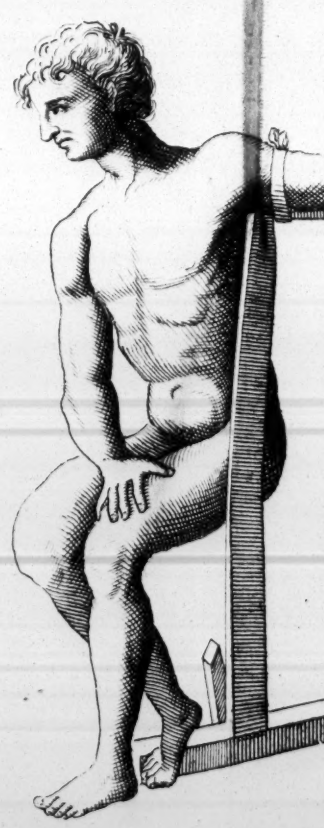












Figures containing Compound Bandages, Sutures & other Machines made use of in T
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N° XV.

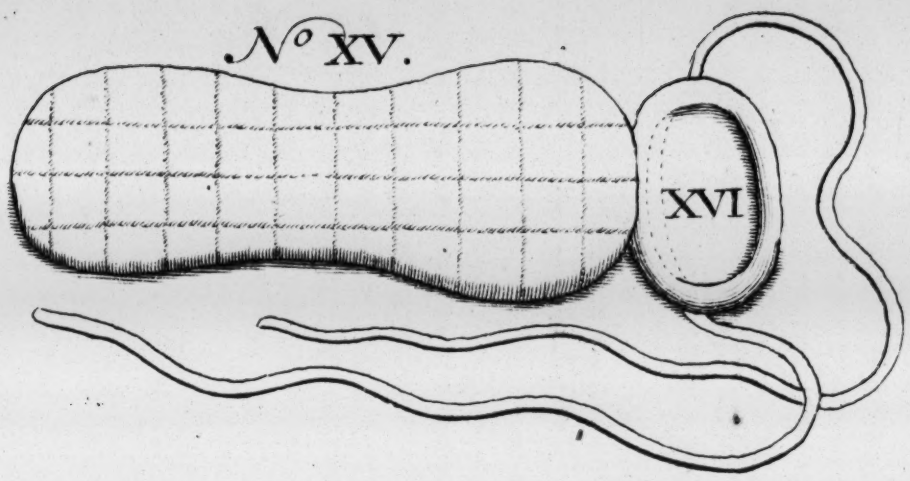
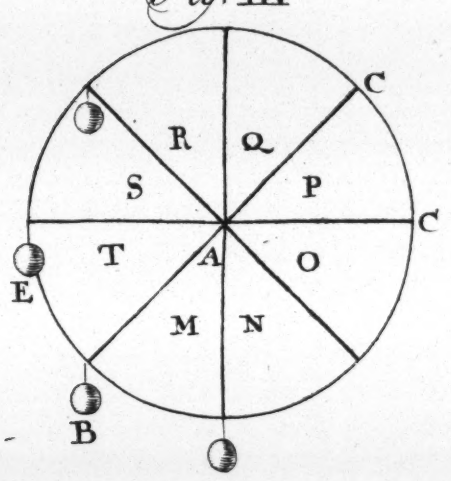


Fig: I

N° XII.

Fig: II

Fig: III



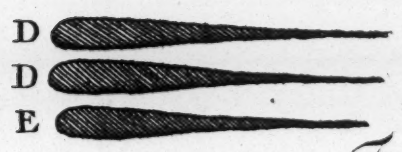
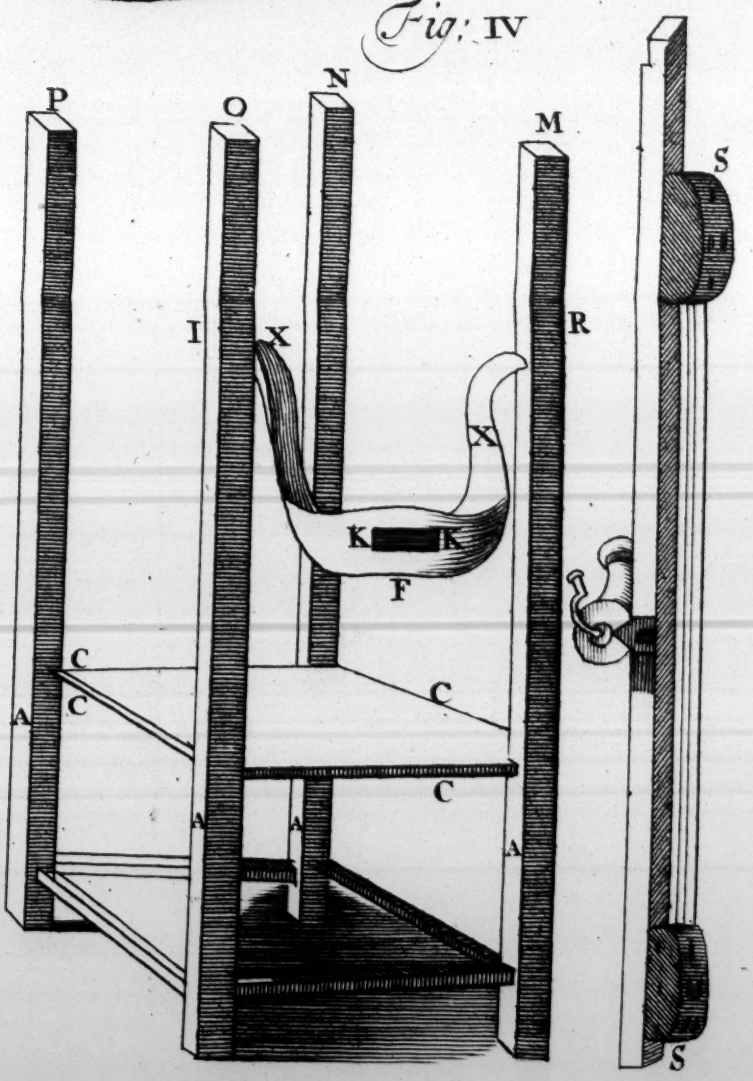
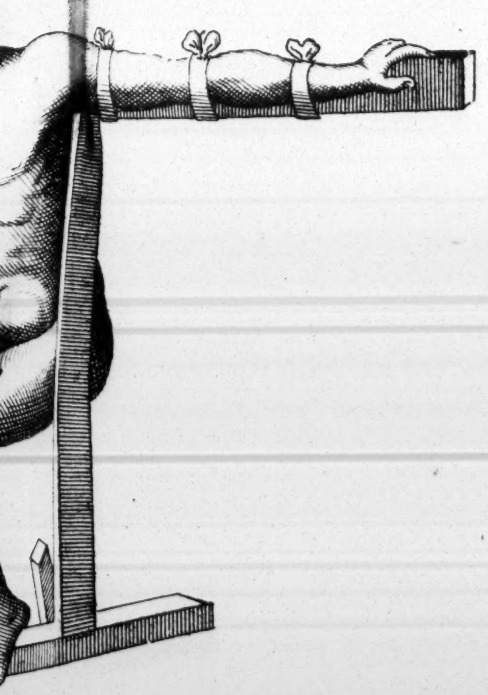


Fig: IV





le of in Fractures. Luxations &c. done from M^r. Petit master Chirurgion at Paris &c
nted there 1709

Nº XVI.

A ſmall Roll for the ſupporting the Heel.

The Inſtrument called by *Hippocrates*, *Ambée*, (or *Commander*) is formed of Two Pieces of Wood. That which is the *Reſt*, is about a Yard high, three or four Inches broad, and two Inches thick. On the upper End it is cut thro' with a Notch thinwiſe, into which the upper Part is adapted, and moves like the Handle of a Pump, on a Pin that paſſes thro' it ſelf and the two Cheeks of the *Reſt*, which is to ſtand on the Ground upon a Foot. The *moving* Part ought to come out a little beyond the *ſtanding* one, and to have the End round and ſmooth, being a little hollowed to bear the more equally upon the Head of the Bone. When you uſe it, the *Reſt* is to be placed cloſe to the Patient's Body, and his Arm tied to the *moving* Part, which by being preſſed down makes a due *Extenſion* and *Counter-Extenſion*, and reduces the Bone.

This Inſtrument has theſe Advantages: *Firſt*, That the Arm is in the Poſition it ought to be, conſidering the *Elevator* and *Abductor* Muſcles are relaxed.

Secondly, That it hath a ſufficient Force, ſince it is made like a *Leaver*, whoſe *Reſt* is a great Diſtance from the *Power*, and may be made greater or leſs as Occaſion requires.

The *Extenſion* and *Counter-Extenſion* are equally ſtrong, and made at the ſame Time, by Reaſon the Cauſe which produces them acts *then*; which is a very eſſential Requiſite in all Inſtruments that are uſed to reduce Luxations.

Now you'll ſee its Defects: *Firſt*, it puſhes the Head of the Bone into its Cavity before there is a ſufficient *Extenſion* and *Counter-Extenſion*, which, as I have already remarked, hinders the Reduction being according to Art; for there ought to be ſuch an Extenſion of the Limb, that the Head of the Bone may be a ſufficient Diſtance, and as it were reduce it ſelf.

Wherefore to make a Reduction eaſily, and as it ought to be, the Inſtrument that is uſed ſhould make a ſufficient *Extenſion*, without making at the ſame Time a *Coaptation*, which is a great Fault, and chargeable on the *Ambée*, whether you uſe the ordinary one, or the *Door* or *Ladder*; for when you raiſe the Point that is under the *Armpit*, the Bone is puſhed againſt the Neck of the Shoulder-Blade, and forced into the Cavity before there is a ſufficient Extenſion.

There are ſeveral other Ways of reducing the *Humerus*; as the putting a Stick croſs two Men's Shoulders of equal Height, pulling the Patient by the Arm on one Side of the Stick, whilſt his Body hangs on the other; or by a larger Man than himſelf pulling his Arm over his Shoulder, which is to be under the *Axilla*, ſo that the Body hangs behind him: But as all theſe have the Defects of the *Ambée*, I ſhall ſay no more of them, but proceed to the *Pulley*.

The *Pulley* (as every Body knows) is compoſed of ſeveral *Wheels*, which are let into different *Mortaiſes* in the ſame Piece of Wood, which is called the *Head*, and that they move on the ſame *Axis* or *Pin*, which runs quite through them. The Force of this Inſtrument is inconceivable. I ſhall only ſay in general, that it proceeds from every Part of the *Wheel* which compoſes it, being a perpetual *Leaver*, ſeveral of which go to the making a Pulley.

To explain how this *Pulley* is a perpetual *Leaver*, ſee *Fig.* I. which repreſents a ſingle *Leaver*. The fixed Point in A, the Weight at B, and the *Power*, or *moving Force*, at C.

Join theſe Two *Leavers*, as you ſee in *Fig.* II. which will be the Beginning of a Wheel, to which if you add Two or Three, it will make a compleat one, as in *Fig.* III. where Four Leavers, which have all the ſame *Reſt* in the Point A, compoſe a *Wheel*; and inſtead of the Four *Leavers* which compoſe this Wheel, you may imagine as many Lines as can paſs thro' the Center from one Side of the Circle to the other; and they will be all *Leavers*; ſo that when the Spaces M, N, O, P, Q, R, S, T, are filled up, it will be a compleat *Pulley*.

'Tis evident that the *Pulley* has a greater Force than any other *Machine*, becauſe it is compoſed of ſo many *Leavers* that immediately follow one another; becauſe the *Pulley* is round, and we learn from the *Mechanicks*, that the Succeſſion of *Leavers* multiply the Force.

If a ſingle *Wheel* has ſo much Force, the *Pulley* muſt needs have a great deal more; for as the *Wheel* is a Multiplication of *Leavers*, ſo the *Pulley* is a Multiplication of *Wheels:* And if the *Leavers* of the ſingle *Wheel* follow one another, the *Wheels* of a *Pulley* muſt do the ſame alſo.

The *Pulley*, with which the Earth might be liſted up if a fixed Place was found to faſten it to, is the ſame that is made uſe of in the Reduction of diſlocated Limbs.

It is uſed different Ways: Some having tied the Patient faſt, and fixed the *Pulley* to ſome unmoveable Point, hook it to a Hook that is on the Patient's Arm, and by drawing the Cord that runs through the *Pulley*, make the Extenſion as large as they think neceſſary.

This is a very plain Way; and for that very Reaſon ſhould be preferable to any other, if there was the ſame Advantage and Readineſs as in Mr. *Michault* the *Father*'s Engine, which is very perfect, and worthy its Inventor. I call him the Inventor, becauſe ſome ſay 'tis only *Hippocrates's Bench* a little altered; but it is ſo different, that *Hippocrates* himſelf would confeſs the Imperfections of his own *Machine*, and look on this as a Maſter-piece.

Notwithſtanding which, it ſeems to me impoſſible to put the Patient in this *Engine* into ſuch a Poſture as I have often recommended, and which I think is abſolutely neceſſary; for when that is not obſerved, the Elevators of the Arm and the *Biceps* are too much extended; from whence it comes to paſs, that moſt of thoſe whoſe Arms are reduced whilſt they are in ſuch a Poſture, are a long Time before they recover the Uſe of them. I ſaw *One* in whom ſuch an *Extenſion* was made, with the Arm parallel to the Body, where the *Carnous Fibres* of the *Biceps* were ſeparated from its external *Tendon*, which cauſed a Tumor in the middle Part of his Arm, the Fibres contracting themſelves into a Bunch.

It is impoſſible to place the Patient in a convenient Poſture, becauſe the Bow is ſituate *horizontally*, or at leaſt *obliquely*; whereas it ought to be *perpendicularly*, which would be impoſſible unleſs it were faſtened to the Plank; but then the Roll of the Bed would be uſeleſs.

This is the Reaſon why I have invented the *Machine*, of which take the following Deſcription: See *Fig.* IV. A, A, A, A, are Four *Pillars* of a Chair without any Back fixed to it, that it may ſerve for either the Left or Right Side (according as the Luxation ſhall happen) by the Help of Two Wooden *Pins* that go through the Holes of the *Pillars*. C,C,C,C, is the Seat. D,D, are the Two Wooden Pins which make the Back of the Chair, by paſſing through the Pillars M, N, or O, P. E is another *Pin*, which goes croſs the *Pillars* P, N, placing it higher or lower according to the Size of the Patient. This Pin is covered with a thick Quilt, or a doubled Napkin; it paſſes under the well Arm, that is faſtened to it, for fear the Patient ſhould not hold himſelf faſt, which would be very incommodious to the Surgeon during the Operation. K, K, is a Machine called the *Creſcent*, having two Horns very large, marked X, X, one of which conſtringes the Omoplata, (like an Hand) and the other the Fore Part of the *Thorax*. This *Creſcent* is lined, for fear of hurting the Patient. There are Two *Pegs* that go into the Holes that are in R and I. There is alſo a deep *Mortaiſe* in the thick Part marked F. It receives the ſquare *Tenon* which is at the End of the Piece of Wood to which the Pulley S S is faſtened, as in *Fig.* III. to which is put a little *Winch* or *Rowler*, placed underneath for the greater Convenience: For which Reaſon I am obliged to paſs the Cord through that Piece of Wood on which is another Pulley that encreaſes the Attraction. The Patient is ſeated with his Back towards M N, his Breaſt to R, his Left Arm over the *Creſcent* K K; of which the thickeſt Part is placed under his *Armpit*; one of the Horns embrace the Shoulder-Blade, and the other the Breaſt. The Piece of Wood on which is the Pulley is put into the Mortaiſe F, and the Pulley is hooked to the Nooſe which is faſtened on his Arm; then you turn the *Winch* by the Handle which paſſes through it, ſo that you may make an Extenſion in what Degree, and as you pleaſe; for the *Wheel* that holds the *Winch* is made with *Teeth*, and a *Spring* which ſuffers it to move forward, that hinders it from running backward again.

When

When the Extenſion is made, you lower the End of the Piece of Wood, let go the End of the Cord of the Pulleys, and the Reduction is done.

This Motion is uſeleſs in new Diſlocations, where the Head of the Bone is drawn into its Cavity, as ſoon as it is extended parallel to the Cavity.

This is all I have to ſay, both of the Luxations of the Arm, and the ſure Ways to replace them. I am ſenſible that every one prefers thoſe Methods by which he has had good Succeſs to all others; but as all don't ſucceed, 'tis ſafe to have Recourſe to good Engines, ſuch as we have deſcribed, which being grounded on the Mathematicks, muſt be as infallible as the ſame is.

A particular Account of the Rickets, *with its Cauſe, Effects and Cure. From Mr.* Petit, *Maſter-Chirurgeon at* Paris.

THE *Rickets* is a Diſeaſe Children are more particularly ſubject to, and what is principally to be obſerved is, that thoſe Children who are moſtly afflicted with it, are generally lively and more penetrating, or what the Nurſes ſay, forwarder than others. The Organs of Senſe are well diſpoſed, their Faces look full and Plump, the Head is large, and the Complexion ruddy; they eat plentifully, and with an Appetite, the Liver and Spleen is groſs, yet of a natural Colour and Conſiſtence, and there are a Thouſand Indiſpoſitions render theſe poor Infants the Objects of our Care and Pity.

In this Caſe, from the fine Appearance I juſt now ſpoke of, they grow lean and meagre, and leſs Fleſh upon the Joints than uſual. The *Spine* is crooked, the Joints relaxed, the *Epiphyſis* of the Bones blown up, and the reſt ſpongy; the Sutures ſhoot over, the Sides are depreſſed, the Bones of the *Ilea* and the *Omoplata* enlarged, the great Bones of the Limbs grow crooked; and in ſhort, when you come to open the Body, you find the Lungs adhering to the *Pleura*, livid, ſcirrhous, and full of Abſceſſes, and all the Glands clogged up with a thick *Lympha*.

That we may explain ſuch an extraordinary Diſeaſe, ſo as to proceed to a Cure, we ſhall endeavour to diſcover the Cauſe, that we may be able to find out the Effects: And this will come under Three Heads. In the Firſt, I ſhall enquire after the Cauſe of the *Rickets*; in the Second, I ſhall explain or unfold all thoſe Effects that follow the ſaid Cauſe Step by Step; and in the End, I ſhall propoſe ſome Remedies that are proper to prevent, palliate, or cure the ſaid Diſeaſe.

I will begin with the primitive Cauſes which occaſion the vicious Humours of the Blood or Spirits, which I ſhall reckon five particular to Infants; to wit, the Difference of Countries or Climates. In the Second Place, *Teeth*. Thirdly, *Worms*. Fourthly, Bad Milk, and other Food. Fifthly, the Change of Aliment or Suſtenance when weaned. Countries oftentimes occaſion thoſe vicious Humours from whence *Rickets* proceed, and ſo make it as it were a national Diſtemper: So *France*, *Flanders*, *Holland*, and *England*, are afflicted with this Malady; and without Doubt it proceeds from the Air being leſs loaded with ſaline Particles that are volatile and ſulphureous than the other Parts of *Europe*; and theſe are the eſſential Principals of the Firmneſs and Strength of the Bones.

When the Teeth begin to cut, the Child is then in Danger of falling into the *Rickets*, occaſioned from the Pain which is produced by them, which ariſes chiefly from Two Cauſes; the one is to be taken from the many little Points of the Teeth ſhooting thro' and lacerating the nervous Fibres of the Gums, cauſing a very acute Pain: The other is to be attributed to the Gums themſelves, which are too hard; ſo that the Teeth cannot cut them, and conſequently the fine Fibres that compoſe thoſe Parts are more rudely broke thro', which produces a more exquiſite and violent Senſation.

This Pain may occaſion the *Rickets* Two Ways; Firſt, becauſe it is the Cauſe of much Crying, of the Fever, of Want of Sleep, of Convulſions, all which Accidents are dreadful to Children, and what is more capable of hindering *Chylification*, weakening, or taking,

king away their Strength, altering or interrupting the regular Diſtribution of the *Fluids*. In the Second Place, the Gums are inflamed by the Irritations from the Teeth; ſo that the Child dare ſcarce move the Jaws, for fear of preſſing the Gums one againſt the other, ſo as to exaſperate the Pain; for which Reaſon the poor Innocent is to be pitied when you ſee him put his Fingers to his Mouth, as if he would aſſiſt the cutting of the Teeth by his rubbing of his Gums. At the ſame Time he will hardly be perſuaded to the Breaſt, but refuſe that rather than provoke the Pangs of the Gums from the Motion of his Jaws. In ſhort, from his Indifference to ſuck, and from the Motion of the Tongue and the Jaws, the Salivatory Glands are compreſſed, ſo that the *Saliva* flows plentifully out at the Mouth down into the Stomach and Guts, and there produces a Flux or Scour of the Belly, which joined to the other Accidents occaſioned from hence, reduces the poor Infant to a pitiful Condition.

Worms produce very great Diſorders: Children that are troubled with them cannot ſleep without Interruption; they grind their Teeth aſleep, and have Convulſive Motions; they have exquiſite Gripings, which ceaſe for a ſhort Time after Eating. Their Bellies are puſt up, the Colour in their Faces altogether red, or very pale; they look meagre, and have voracious Appetites, a dry Cough, and their Mouths always full of *Spittle*. Their Sleep is broken, becauſe every Time the Worms gnaw upon the Membranes, or Coats of the Guts, they cauſe a ſudden Motion of the Spirits.

The *ſharp Gripes* come from theſe Three Cauſes; Firſt, from the Motion of the Worms againſt the Sides of the Guts, which acts like the rubbing of a Feather to and again upon the Sides of the Lips. Secondly, by the Acuteneſs of their Teeth; for 'tis certain Inſects have all Teeth, by the Obſervation we may daily make of their biting Wood, Stones, *&c.* and their eating of Fruits and Grains, as Nuts, Acorns, Walnuts, *&c.* Thirdly, from the Impreſſion of the Vermous Matter againſt the Fibres of the Guts, which is capable of producing Gripes, ſuch as are acted by Things betwixt ſweet and ſour.

The *Twitchings* or *Startings* proceed from a Senſation of the Fear of that Pain from the Nerves which cauſes a Reflux of the Animal Spirits. And we may obſerve again, that the *Convulſions*, *Startings*, and *Convulſive Motions*, are not altogether cauſed by thoſe Things before ſpoke of betwixt ſweet and ſour, which entring into the Maſs of Blood, acts upon the nervous Membranes, and cauſes thoſe Irritations; but rather chiefly from the Reaſons before-mentioned, of the Worms lodging upon the Coats of the Guts, and occaſion the Contractions or Gripings of the ſame by their Gnawing and Feeding upon the Mucous or Slime.

If Children are fed with bad Milk from the Breaſt, that is, from ſuch Nurſes who live ſo diſorderly as to vitiate their Milk, this is apt to throw them into Rickets and Conſumptions; becauſe that Fluid is not fitly prepared to be a proper diſſolvent, and ſeparate all the Principles of the ſolid Aliment, ſo as to make good Chyle. From whence proceed theſe Two Things; Firſt, that the Blood that comes from thence is diveſted of its active Principles, which would prevent the *Rickets*; and the other is, that the Child has not ſufficient Quantity of Spirits to ſupport it under its Agonies, but is expoſed to all thoſe Accidents of which I was ſpeaking before.

I have aſſerted, that Changes of Air, ill Milk, Pains in Breeding of Teeth, Worms, Alteration of Diet, and other Cauſes alledged, alter the Chylification; becauſe the Blood wants enriching with volatile Salts and Sulphurs, without which the Bones become ſoft and ſpongy; and from the Analyſis of that Liquid we are ſatisfied that the nutritious Juices ought to be fill'd or ſupplied with thoſe Principles, and that the firm Texture of the Bones depends on an intimate Mixture of the ſaid Juices in the inward Parts and Extremities of the Bony Canals.

All thoſe Bones which are porous, are much eaſier made ſoft than others, as we may obſerve by the Softneſs of the *Vertebræ*, which are formed ſo by Nature for the Introduction of the Nerves, which are diſtributed along the ſpinal Marrow, which when too cloſe compreſſed, hinder the Courſe of the Animal Spirits from communicating their Effects to other

other Parts of the Nerves; and becauſe the Animal Spirit is made for the Nutrition of the Parts, as ſhall be proved in the following; for when the Parts are diveſted of the Uſe of the nervous Juice, they become dry and meagre. Upon theſe Principles it will be eaſy to explain many other *Phænomena* which attend theſe Diſeaſes, and which I ſhall produce afterwards, to account for the Crookedneſs of the Bones.

Of the Crookedneſs of the Bones in Rickets.

Gliſſon, a famous *Engliſh Phyſitian*, would have it, that this Crookedneſs proceeds from the ſame Cauſe; and aſſigns the ſame Reaſon as for the Bending of a Blade of Corn on the Side which lies towards the Sun, or as Parchment, Paper, a Book, and other Things of the like Nature, are bent before the Fire; becauſe the Sun or the Fire raiſes up certain moiſt Particles, which meet in the Pores of the Surface expoſed to the Sun or Fire, and puſhes the reſt to the oppoſite Side. This which is performed in Reſpect to the Surface, is thus: If you bring ſeveral Wedges, in order to the dividing of the ſeveral Parts which make up a Column or Pillar; if you place all theſe Wedges on one Side, the Pillar will be bent on the contrary. To make the Application of this Example to the Bending of the Bones, he ſays, that they grow crooked from the Nutrition being conveyed in too great Plenty on one Side more than the other, becauſe one Side appears conſiderably larger and more tumid. It is for this Reaſon that the ſame Author directs the Rubbing of one Side of the Bone with penetrating Oils and hot Cloths, to recall the Nutrition to that Part, and to make it enter into the Pores by the particular Veſſels, ſo as to extend the Fibres which aſſiſt the Ligaments in their Contraction, which is to be done by Application to the oppoſite Side of the crooked Part.

This Syſtem of *Gliſſon*'s, labours under many Difficulties; and I could confute it all at once, if I might be permitted to inquire, What Cauſe can produce ſo unequal a Diſtribution of the Nutrition into any Bones, ſo as to occaſion that Bone to grow crooked. We ſee the Bones of the Leg grow crooked, or bend both outwards; but according to *Gliſſon*'s Notion it would follow, that they ſhould be crooked the contrary Way.

Mayow propoſes an *Hypotheſis* entirely different: He ſays, That this Diſeaſe proceeds from the Tendons being contracted, the Muſcles dry'd up and abridged of their Nutrition: Therefore the Bones are hindered or tied up from their Growth, in the ſame Manner as a Cord which is tied to the Top of a young Tree obliges it to bend, becauſe the Cord will ſtretch no further, and the Tree makes its utmoſt Efforts to grow longer.

I ſhall agree with *Mayow*, that the *Crookedneſs* of the Bones depends on the Shortneſs or Contraction of the Muſcles; but I ſhall add, without their Pliableneſs or Softneſs of Contexture the Crookedneſs could not be effected. 'Tis certain, the Bulk of the Body and the Head contributes conſiderably and particularly to the natural Bent of the Bones throughout the whole. But I ſhall aſſign Four Cauſes for the Crookedneſs of the Bones in the *Rickets*; to wit, their Softneſs, the Action of the Muſcles, the Weight of the Body, and their natural Bent or Crookedneſs.

To ſpeak of every one of theſe in Particular, I ſay firſt of all, that the *Spine* is crooked becauſe the *Vertebræ* are ſoft and yielding. Secondly, from the Action of the Muſcles *Pſoæ*, which are oblique in the lower Belly, draw towards the *Breaſt* before, and force the Spine backwards. Thirdly, the *Head*, which is very large in the *Rickets*, and a conſiderable Weight upon the Spine, which, notwithſtanding its Solidity, is forced to bend like a Pillar of *Lead*. Fourthly, the Orifice of the Neck is crooked behind, and the Cavity of the Trunk before, the Back is crooked forwards, and the Hollow of the *Ileæ* behind; and ſo of the other Parts of the Spine, for all thoſe Parts are naturally bending.

The Sides are flat in the middle, and puſh inwards, by Reaſon of the Preſſure of the Pectoral Muſcles, and the Half-Arch they form by their Crookedneſs; whence it comes that by their Motion Reſpiration is ſtop'd, becauſe the *Sternum* is puſhed inwards. The

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Cartilages and the Lips of 'em are made larger on that Side towards the Cavity of the Breaſt, that nothing might preſs inwards.

The Bones of the *Ilea* are ſtrait, and bend inwards, by the Contraction of the Muſcles of the *Ilea*, which are fixed to their Sides to contract and make thoſe Bones crooked.

The Bones of the Arm change not their Figure, but are moved by the Muſcles with equal Force. It is obſervable, that when the Softneſs of the Bone is great, it is not only crooked in the hinder Part of the Bone, and hollow before, at the right Inſertion of the *Deltoides*, and the Origine of the *Anterior Muſcle*, but is three Times as much, and looks as if half broke at that Time, as I have often ſeen, which happens by the oppoſite Action of the two Muſcles. The Accident does not only attend the Bones of the *Arm*, but is familiar to thoſe of the *Thigh* and *Leg*. The Bones of the right Arm are crooked outwardly, becauſe the Muſcles are ſtronger in thoſe Places.

The *Thigh-Bone* is ſurrounded with ſtrong and large Muſcles, yet is not free from Crookedneſs; for many Reaſons:

Firſt, becauſe it is ſubject to a great many Motions which cannot be executed by the Action of the Muſcles, and we have proved, that ſuch Actions are the Cauſes of the Bone's Crookedneſs.

Secondly, becauſe it is much longer than any other Bone of the Body, and it is much eaſier to bend a long Body than a ſhort one.

Thirdly, becauſe it is naturally more crooked than the reſt.

The Fourth Reaſon is, becauſe the Weight of the Body preſſes more directly perpendicular upon this Bone than any other; the two Bones of each Leg being poſited rather Archwiſe, ſo that they relieve the Weight with greater Eaſe.

The Explanation of the Phenomena of the Rickets.

NOthing remains further, but that I give you a compleat Idea of the *Rickets*, in which I ſhall account for the Largeneſs of the Head, the Well-looking of the Face, the Vivacity of the Wit, the Delicateneſs of the Organs of Senſe, the Leanneſs of the Parts about the Neck, the Fulneſs of the internal Parts, the Narrowneſs of the Breaſt, and the Difficulty of Reſpiration. In ſhort, the Adherence of the Lungs to the *Pleura*, their Hardneſs or Tendency to a Scirrhous, their Lividneſs and Abſceſſes within, the Puffing up, or Swelling and Hardneſs of the *Thymus*, the *Glands*, *Mediaſtinum*, the *Pancreas*, and the *Meſentery*.

As to the Largeneſs of the Head, that depends on the Softneſs of the Bones of the Skull, of the membranous Sutures, and of that of the Brain, which receives the Blood in greater Quantities than the other Parts, by Reaſon of their Sinking, which encreaſes the Bulk, and by Conſequence ſtretches out the Sutures, and ſeparates the Bones of the Skull which were cloſed.

The good Look of the Countenance, and the Fineneſs of the Organs of Senſe, thro' which the Animal Spirits flow without Interruption, ſhow that thoſe Organs are moved with leſs Impreſſions from the exterior Objects than others.

The Wit of ricketty Children is generally lively and penetrating, becauſe there are more Filtrations through the Brain of theſe than others; hence it comes, there are a Quantity of Spirits elaborated for the Functions of the Soul, which makes the Organs of Senſe more eaſily moved.

The Parts which are about the Neck are lean, and waſted away; becauſe the Animal Spirits which are diſtributed paſs by the *Spinal Marrow*, and the Diſorder of the *Vertebræ* which preſs upon the Roots of the Nerves hinder their Influx.

The *Liver* and the *Spleen* are larger than ordinary, becauſe their Nerves come from the Eighth Pair, and the *Intercoſtals* which ſpring from the Brain.

The Difficulty of Reſpiration is great; firſt, becauſe the *Liver* and the *Spleen* which appear in good Condition, occupy too large a Space in the *Hypochondria's*, and oblige the *Diaphragm* to make a convex Figure, which ſtraitens the Liberty of the Breaſt.

Secondly, the Sides of the Ribs are flat, which force them inwards, and that renders the Cavity of the Breaſt yet ſtraiter.

Thirdly, the Muſcles which ſerve to move the Sides have little Force, and the Sides by their Laxneſs and Weight are more difficultly moved.

Fourthly, the turning aſide or Perverſion of the *Spine* makes the Crookedneſs before. When behind, or upon the Sides, it changes the Diſpoſition of the Sides, and the Direction of the Muſcles which give them Motion. Theſe Four Points being well explained, it will not be difficult to aſſign a Reaſon for the Adherences, the Abſceſs, and the Scirrhous of the Lungs; tho' there is another Difficulty of Reſpiration to be underſtood from theſe two Cauſes; to wit, the ill Quality of the Blood, and the Force of the Heart.

The ill State of the Blood, which is groſs, and moves ſlowly, not only by the Means of a difficult Reſpiration, but becauſe the Chyle that is made is crude, and of an ill Digeſtion, as I have made appear ſpeaking of the ill State of the Blood, ſtopping in the Capillaries of the Veins and Arteries of the Lungs, and other Indiſpoſitions of the Organical Parts.

But one of the principal Reaſons is the Force of the Heart, which one would think ſhould be weakened in this Diſeaſe; but is rather increaſed; ſo that the Blood is propelled from the Right Ventricle of the Heart with much more Eaſe than it is puſhed thro' the Lungs to return to the Heart again; and this is no ſmall Cauſe of the Diſorders that happen.

In ſhort, it will be eaſy to give a Reaſon why the *Thymus*, the Glands of the *Mediaſtinum*, the *Pancreas*, and the *Meſentery*, are *Scirrhous*; the one of which ſerves for the Paſſage of the *Lympha*, the others for the Filtration of proper Juices, and, in ſhort, thoſe of the *Meſentery* for the Preparation and Paſſage of the *Lympha* and the *Chyle*, and whatſoever is capable of thickening and agglutinating one or other of theſe Fluids, is at the ſame Time the Cauſe of the Glands Obſtruction, together with its Hardneſs and Swelling or Tumefaction.

Of the Prognoſtick Signs, and the Cure of the Rickets.

AS I have thought it ſufficient to give you an *Idea* of the Softneſs of the Bones, their Crokedneſs, and other Accidents that depend thereon; we ſhall now come to the Prognoſtick Signs and the Cure. It is rare to make a Cure of the *Rickets* when it is accompanied with a *Hydrocephalon*, becauſe that Diſeaſe is generally mortal; particularly when it arrives at this Point, that the *Sutures* of the *Cranium* are divided.

One rarely cures thoſe whoſe conglobate Glands are hard and ſcirrhous'd, particularly when thoſe of the *Meſentery* are affected with this Vice, becauſe the Chyle cannot then make its Traverſe thro' the Glands; and as the Paſſage is ſtop'd up, ſo that the Chyle cannot be percolated or ſtrained thro' the Glands, ſo as to mix with the Blood and recruit it, the Animal for Want of it muſt inevitably die. Thoſe which cannot without great Difficulty breed their Teeth, are rarely cured, becauſe the Time is ſo long frequently before they can receive any Food from the Soreneſs of the Gums, that the Infant lanauiſhes and pines away.

But thoſe whoſe Crookedneſs do not affect the *Spine*, are much eaſier cured. In ſhort, thoſe who eat with an Appetite, and are chearful and lightſom, are oftner cured than others. If we have Regard immediately to this Diſeaſe, we muſt conſider it as others, that it is much eaſier to cure it in the Beginning, than when it has made ſome Progreſs; and is with a great deal leſs Difficulty prevented before it has gained too much Ground, than to ſtop it afterwards in its Conſequences: And that when it is in this State at firſt, there is much leſs owing to Art for its Cure than there is to Nature. But this is certain, you can never deſtroy any Thing of the Effects, without rooting out the Cauſe. Therefore to purſue the Cure in order, as we have here done, you muſt have Regard to the primitive Cauſes;

after which remove the Second Cauſes, and their Effects.

As to the Primitive Cauſes, you muſt do all that is poſſible to that the Child may have Freedom of Breathing in the fineſt Air, and that nothing be adminiſtred to it which may produce or breed Worms; but be particularly cautious of giving the beſt of Nouriſhment, and take Care not to wean it from the Breaſt too ſoon, if the Milk be good, leſt the Breeding of their Teeth come upon them with Difficulty, and then forſaking their Food, they fall into this Malady. But if, after all the Precautions we are capable of, the Infant be ſeized with this Diſeaſe, in two Words, What muſt we do to cure it abſolutely, or to palliate it?

To preſcribe inſtantly a *Regimen* or Method of Living, this is to be followed ſeveral Ways, as the Cauſes are different. If the Air be in Fault, that or the Sick muſt be changed. If it is not poſſible to alter the Patient, you muſt correct the Air by Scents loaded with ſulphurious Particles, and by burning of Partridge Feathers, Goats or Hartſhorn, and other Things of the like Nature that abound with volatile Salts.

If the Teeth are painful by Reaſon of their cutting thro' the Gums, to render them more eaſy, rub 'em with the Blood of a Cock's-Comb, the Brain of a Hair, Oil of Sweet Almonds or Lillies, and other innocent Remedies, whoſe Succeſs is generally the beſt in theſe Caſes; and if the Gums are too hard, make Inciſion to facilitate their Paſſage.

When *Worms* are troubleſome, Bleeding relieves the Inflammation; or give Aſſiſtance with Milk of Figs, Raiſins, and a little Sugar. Or on the contrary uſe Bitters, as the Preparations of *Wormwood*, *Succory*, *Rhubarb*, *Opium*, and other the like Medicines proper for killing of Worms. Or otherwiſe, if Purgatives are found neceſſary, give Syrup of Succory with Rhubarb, or inſtead thereof, the magiſterial Syrup; which will produce very good Effects, for the Bitters deſtroy the Worms, and the Action of the Catharticks accelerates the Paraſtaltick Motion of the Guts to expell the *Sordes*.

Neither ought we under this Head to forget the Uſe of *Emeticks*, and the *Mercurial Preparations*, which are very uſeful for the Deſtruction of the Worms, and the Evacuating of the *Vermous Matter*. If the Nutriment which at firſt ſuſtains the Infant be not ſuch a Milk as is proper for the Habit of the Child, it produces ſtrange Diſorders and Diſtempers, and therefore it is neceſſary it ſhould be changed, and that the Child ſhould have ſuch proper Aliment found out for it as may, in ſhort, correct the *Chyle*, the *Blood*, and the *Lympha*; ſo that all the Parts of the Body may appear in a good State, the Bones grow hard, the Teeth cut, and the Child have Strength ſufficient to undergo the Pain, ſo that if it fall into this Diſeaſe of the *Rickets*, having had a ſuitable Support to bear up againſt the Diſtemper, it is able to overcome and vanquiſh the Second Cauſes, and thoſe Effects that produce it.

Purge the Body now and then, but let it be ſparing, becauſe it is of leſs Moment to make Evacuation than it is to correct the *Blood* and the *Lympha* by Decoctions of the Volatile and Sulphureous Plants, by Broths made with Powder of Vipers, and inſtead of common Salt, the Volatile Salts of *Hartſhorn*, of *Human Skull*, or in a Word, all the Volatile Oily Salts are proper.

Some Obſervations of the Teeth, *with the Diſeaſes thereunto belonging and their Cures. Taken from* Havers, Muſitanus, Petit, *&c.*

ALtho' the Teeth are of the Claſſis of the Bones, yet having ſome Things particular in them, I ſhall give a diſtinct Account of ſome few Obſervations, which conſiſt of Two different Parts; the one is of the Nature of a Stone, and the other is truly bony. The firſt may well be ſaid to be Stone, when it has not only the Hardneſs of that, but the Solidity of Flints themſelves; ſo as in the ſame Manner to reſiſt the Impreſſions of the Saw; and has beſides ſomething of a ſhining or glittering Brightneſs as the hardeſt of Stones have, tho' after all it muſt be confeſs'd, that it is often eaten away, and will be diſſolved in *Aqua Fortis*, which Flints will not; which, as it ſhows

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us how injurious ſtrong Acids are to this Part; ſo it may direct us to the Uſe of better Means for Whitening the Teeth than Spirit or Oil of Vitriol, or any Thing of that Nature. This I call the *Cortex* of a Tooth, and is plainly and eaſily to be diſtinguiſhed from the other Part. The ſeveral Parts or *Striæ*, of which it conſiſts, differ in their Poſition from the Strings in the bony Part not being ſtrait in the Length of the Tooth, but on the Sides oblique near to a tranſverſe Poſition in ſome Animals, and upon the upper Part of the *Dentes Molares*, where the bony Strings are tranſverſe, and at the very Point or Extremity of the ſharp Teeth they are in a Manner erect. The Figure of theſe *Striæ* in the Teeth of ſome Animals is ſtrait, in ſome a little, and in others more oblique; as in thoſe of Men, in which I have obſerved them to have the Similitude of a Bow, the convex Part of whoſe Arch on the Sides lies obliquely downwards, and the concave upwards, with the lower End planted and fix'd upon the Side of the internal or bony Part, which gives them a Baſis to reſt upon, ſo that when any Thing preſſes upon the other Extremity, they are in no Danger of being protruded out of their Place, having ſo firm a Foundation to ſtand upon, and being ſo diſpoſed, that all Impreſſions are made, not laterally, but at one End of them, and ſo as to make the greateſt Advantage of their *Baſis* in reſiſting their Force, which might move and diſorder them.

Conſidering the Teeth are deſigned for the Breaking and Diſſolving the Parts of our ſolid Food, the Reaſon does appear why that Part which ſtands out of the Gums, and is the immediate Inſtrument of *Maſtication*, ſhould at leaſt be caſed with a hard and ſtony *Cortex*; otherwiſe they would be more eaſily injured by their Action, and ſenſibly worn away. It is true, ſome other Bones are rubbed one againſt another at their Articulations, where they are of a more ſoft and tender Nature, without any ſenſible Injury; but then there is a continual Supply of an oily and a mucilaginous Matter, which prevents their Attrition, which neither the Poſition nor the Office of the Teeth does admit.

When a Tooth is broke, and this ſtony Part is viewed with a Microſcope, it repreſents almoſt a Saw, or rather, the Inequalities or Notches of ſuch a *Grater* as is made to ſome Steel *Tobacco-Stoppers*, excepting only the Obliquity of the *Striæ*; ſo that the Parts, or rather (which I am apt to think it conſiſts of) the *Laminæ* of it, are formed with ſuch Inequalities, that they are applied and joined together by the Way, and in the Manner of a *Suture*, the Teeth or Ridges of one lying into the Notches of the other.

This Part does not ſeem to be allowed any Share of that medullary and oily Subſtance which is ſupplied to other Bones, and is not wholly wanting to that Part of a Tooth which is truly bony: For beſides that I could never diſcover any Thing of a moiſt or oily Nature inſinuated into it, nor obſerve any Thing of an Oil to ſweat out of it, either in a *Skeleton*, or when it it has been drawn from one living, it would be ſo far from doing any Service here, and preſerving the natural Temperament of this Part, that it would be more apt to deſtroy it, as it is, and ought to be, extreamly dry and hard, and ſeems to have ſomething peculiar in its Nature and Conſtitution which preſerves it from being fragil or friable without the Aſſiſtance of any oily Matter. And whether that *Mucus* which is found ſticking upon the Teeth is ſupplied from within, and paſſes out of it, is to be much queſtioned; and it ſeems rather to be ſome *viſcous* or *grumous* and terreſtrial Parts ſupplied from the *Saliva*. And however a Tooth is thought to grow beyond its natural Length when its Oppoſite is wanting, yet this is not ſo certain as not to admit a Diſpute. I have obſerved that in ſome Teeth, when thoſe which ſtood againſt them have been gone, there has been no Elongation.

And if it were ſo that a Tooth had Occaſion to encreaſe its Length from the Want of that which was oppoſed to it, and of that Preſſure which it made upon it, Why do not the Teeth continually protrude their lateral Parts, and acquire an extraordinary Thickneſs in that Part of the *Cortex* where there is not the Preſſure and Oppoſition of another Tooth to hinder it? That therefore which ſeems to be an Elongation, may rather be thought to be the Protruſion of a Tooth, from an Extravaſation, and the Preſ-

ſure of ſome nutritious Juice flowing into the Socket, as we find after a Tooth is extracted, the *Succus Nutritius* of the Jaw is thruſt forth into the Cavity, and fills the *Alveolus* with a bony Subſtance: Or if the Tooth does afterwards grow and exceed its ordinary Length, the Addition that is made to it does not ſeem to be in the cortical Part. It is true, we cannot well imagine, that ſo thin a Subſtance, as hard as it is, ſhould ſerve a Man his whole Life-time without Reparation; ſo that we muſt ſuppoſe, as ſome of the Parts are worn off, they are renewed: But when the Teeth, as well as other Parts, have a certain and convenient Magnitude preſcribed to them, and the Solidity, eſpecially of this cortical Part, fixes the Limits of its Encreaſe more firmly, and makes them more immoveable than they ſeem to be in any other Part of the Body, I cannot think that the ſtony *Cortex* has any preternatural Encreaſe after the oppoſite Tooth is gone.

This ſtony Caſe or *Cortex* in Men, the Lion, and other carnivorous Animals, covers all that Part of every Tooth which ſtands out of the Gums; but when the Teeth come to be protected by them, it grows thinner, and quickly terminates: Neither was it neceſſary that it ſhould be ſo thick and ſtrong where it is covered, ſo as not to be expoſed to that Violence and thoſe Impreſſions which the naked Part ſo often meets with. In the *Dentes Inciſores* and *Canini*, both of Men and Beaſts, all that Part which ſtands out of the Gums is covered with ſuch a *Cortex*; but in the *Dentes Molares* there is a great Difference; for in Horſes, Sheep, Goats, the Antilope, the Rhinoceros, and ſuch Beaſts as live upon Graſs and Corn, the *Baſis*, or that Extremity which lies out of the Gums, is not covered with it, but only the Sides, and it runs to that Extremity, where it ends in a ſharp Edge; but ſometimes there grows over it a bony Cruſt: And whereas in Men and carnivorous Animals there is none of this ſtony Subſtance within the bony Part, it is otherwiſe in theſe Animals in whoſe Grinders there is the ſame Sort of Subſtance within mix'd with that Part which is bony, and that in ſeveral Places, which riſes up likewiſe with an Edge above the bony Part, and is often continued to the Extremity of the Roots. And there does evidently appear a Contrivance of Providence in theſe Parts in ſeveral Animals, accommodating them to the Nature of the Food which the Animal lives upon.

In Men, whoſe Food is generally ſoft, and more fit to be broken into Pieces by Compreſſion, then to be ground, they are *obtuſe*. In the *Lion*, *Tyger*, *Dogs*, and ſuch Creatures as eat Fleſh, but are frequently entertained with no tenderer Food than Bones, though they are covered with a ſtrong *Cortex*, they are ſharp with ſeveral Points. In thoſe Beaſts which are maintained by Graſs, Hay, and Corn, this ſtony Part riſes up in ſeveral Places in Ridges, with a Kind of Edge, and does anſwer to the Inequalities of a *Milſtone*. In Hogs, that eat Fleſh as well as Graſs and Corn, they are covered with a ſtony *Cortex*, but form'd in ſuch a Manner, as makes them of a middle Nature, and fit for the *Maſtication* of both.

Underneath the *Cortex* in humane Teeth, and other carnivorous Animals, and within the ſame ſtony Subſtance in other Beaſts, and within the Gums, is another Part of the Tooth, which is truly bony: And this Bone (for ſo I may lawfully call it) conſiſts of *Laminæ* as other Bones do, which I have plainly obſerved and diſtinguiſhed in a Horſe's Tooth. From the different Nature and Solidity of theſe Two Parts of the Teeth, is the Reaſon evident why they are often ſo haſty in their Decay, when the external or ſtrong Part is once broken off, that they quickly grow rotten and hollow, when the *Cortex*, which is much the thinner Part, endures ſo many Years, and is daily employed without any ſenſible Detriment: And upon this Account it is, that when the Gums are eaten away, ſo that ſome Part of a Tooth, which is not defended with a ſtony *Cortex*, is laid bare, it is eroded, when that Part that naturally ſtands out of the Gums, and is by ſuch a ſolid Subſtance ſecured, ſuffers no ſuch Injury.

The Teeth have all of them, in that Part which lies within the Gums, a *Perioſteum*, but not that Membrane which is common to the other Bones: For that which immediately inveſts ſo much of them as is cover'd with a Membrane is not a Continuation of the

the *Perioſteum* of the *Jaw-Bone*, but is united to, or rather propagated from that Membrane, which covers the Gums, and is common to the whole Mouth, which does not terminate with the Gums, but when it comes to their extream Edge, turns in, and is reflected between the other Side of the Gum and the Tooth; then it deſcends into the *Alveolus*, and adheres immediately to thoſe Parts of the Teeth which lie within. With the Membrane in ſome Teeth it is communicated to their Roots, eſpecially in the Upper-Jaw, ſome Part of the hard and fleſhy Subſtance of the Gums, by which the Teeth are faſten'd more firmly in their Sockets. And becauſe they are Parts which ought to be firmly fix'd, there is the ſame Contrivance for the ſtrong Adheſion of their Membranes, as in other Bones, to wit, Inequalities or ſuperficial Cavities, which enlarge their Superficies. In Men they are often Depreſſions or Pits of an irregular Figure; though in ſome humane Teeth there are circular Furrows, which are conſiderably wide. In the Teeth of the *Rhinoceros* I likewiſe find broad and circular Furrows. In the Teeth of a Tyger theſe Inequalities are alſo Furrows, which are remarkable and numerous; but they are ſtreight, and run from one End of the Tooth towards the other.

But though the Teeth themſelves have no Part of the common *Perioſteum*, yet it comes very near them, for the Sockets in which they ſtand have it. The *Perioſteum* which covers the *Jaw-Bones* running to the Edges of the *Alveoli* or Sockets, turns into thoſe Cavities, being on one Side contiguous to the Bone, and on the other to that fleſhy Subſtance, which helps to faſten the Teeth more firmly; and where none of that hard Fleſh intervenes, it does coaleſce with the Membrane, which does immediately cover that Part of the Tooth which lies within the Gums, and they make as it were but one Membrane.

There is one Thing particularly remarkable in the Teeth, which other Bones do not ſeem to pretend to, and that is *Nerves*. The Reaſon of the Difference ſeems to be chiefly, if not ſolely, for the Sake of that Part which is deſtitute of a Membrane, and to anſwer for the Want of the *Perioſteum*. Though the Deſign and Uſe of the Teeth would not admit of a Membrane in that Part which is immediately employed and do act in *Maſtication*, yet it was neceſſary that ſhould have an Influx of Spirits to aſſiſt in its Accretion and Nutrition, whereupon the Teeth have every one of them a Nerve that ſupplies them to this Part.

The Nerve which runs along in the Jaw, and from whence the Nerve of every particular Tooth is propagated, is plainly a *Faſciculus* of other leſſer Nerves, which I have found to be more in ſome than in others. Sometimes they have been Sixteen, ſometimes Twelve, and in a humane Jaw I once obſerved no more than Seven: But all theſe ſmaller Nerves are diviſible into leſs, till at laſt they reſolve into minute Filaments. The *Foramina* by which theſe Nerves paſs into the Tooth are viſible by the Help of a Magnifying-Glaſs, and many Times without it; and there is always one to every Root, and in a Tooth, which has had only a ſingle Root. I have met with Two Paſſages, one on each Side; and the *Foramen* where it is ſingle is not always formed at the very Extremity of the Root, but very often a little on one Side.

Of the Tooth-Ach, foul Colour, Rottenneſs, and Stinking of the Teeth: Of their Looſeneſs and Falling: Of Children's Difficulty in Breeding of Teeth. From Muſitanus, *&c.*

THE *Tooth-Ach*, at Firſt Appearance, ſeems to be of ſmall Account, yet ſometimes it is ſo extraordinary, as to deſerve a Place and Name among the moſt grievous and tormenting Symptoms which belong to the Body; and then again it is ſo general, that there are few Perſons of either Sex who at one Time or another hath not experienced it. There requires no great Difficulty to know this Diſtemper, therefore I ſhall beſtow no further Time about the Signs thereof, but only give ſome Rules to know whether the Pain ariſes from the Membrane that inveſts the Tooth in the Gum, the Nerve, the Hollowneſs and Rotten-

tenneſs of the Bone, Worms in the Subſtance thereof, a Flux of Humours, or a flatulent Spirit in the Blood.

When the Pain is ſeated in the Membranes, it is not ſo deep, but extends it ſelf only along the Gums, and is ſubject to ſhift from one Tooth to another. If the Pain be in the Nerve, it lies deeper, and is more violent and intenſe to a Point. If the Tooth be Hollow, and rotten with a *Caries*, or have Worms in the Part, the Pain is determined by the Motion of the Worm, and has its Intervals according as the Worm moves more or leſs. If it ariſes from a Flux of Humours, a *Catarrh*, or the like, it is then fixed to the *Maxilla*, the *Jaw-Bones*, and the *Alveoli*, or Sockets of the Teeth; which, if attended with a flatulent cold Rheum, is rarely diſcuſs'd or repell'd without Revulſions, by *Emeticks*, *Veſiccatories*, or *Catharticks*, and ſometimes requires all theſe Treatments; but Blood-letting in this Caſe is rarely or ſeldom of any Importance: But Perſons who have been perſwaded upon theſe Occaſions to make Uſe of Horſe-Leeches to the Gums, have experienced the diſmal Conſequence of applying thoſe venemous Creatures to the Gums, when they have been highly inflamed by the Anguiſh of the *Tooth-Ach.*

The Methods of Cure are ſo various, that it may be judged a fruitleſs Undertaking to attempt the Preſcription of any: But ſince this Diſeaſe falls under our Conſideration, we muſt give ſome Directions, which ſhall be general, and leave them to every one's particular Practice. Among the Generals we ſhall reckon, the Chewing or Smoaking of *Tobacco*, the Roots of *Pellitory* of the *Wall*, or *Angelica*; but if theſe prove ineffectual, by Means of their too hot Qualities, or ungrateful Taſte, we ſhall ſupply their Places with a Decoction of *Henbane-Root*, Two Drams and a half, in Five Ounces of *White-Wine*. Boil theſe in a cloſe Veſſel, and waſh the Mouth well therewith, or with a *Decoction* of the ſaid Root and Seed, *Lettice*, and *White-Poppy-Seed*, with half a Scruple of *Opium* in *White-Wine*. Waſh with it warm, and it will prove very efficacious to allay the Paroxiſm. The Seed of the *Henbane* is ſuppoſed to repreſent the Figure or Likeneſs of the *Maxillary Teeth*, and therefore the *Root*, *Oil*, *Seed*, or *Juice* expreſs'd, are accounted the nobleſt *Odontalgicks*. Uſe a Decoction of *Savine-Tops*; hold this in your Mouth as long as you are able to bear it, and it removes the Cauſe, eſpecially if proceeding from Worms in the Teeth, which this deſtroys effectually. If this fails, you muſt have Recourſe to *Lapis Prunellæ*, held in the Mouth, to promote *Salivation.*

But let the Pain proceed from what Cauſe ſoever, the following *Odontalgicks* not only mitigate but remove the Pain; ſuch as the Roots of the *ſharp-pointed Dock* cut in Pieces, dried, and put into the Tooth, if hollow, or otherwiſe applied to it. So Oil of *Box*, diſtill'd either by the *Retort* or *per Diſcenſum*. The ſame is to be done by Oil of *Camphore* and *Cinnamon*, dipping a little Lint in them, and applying. If the Pain be extravagant, it requires *Narcoticks*, of which, Spirit of *Wine camphoriz'd* is One, or *Camphore* diſſolv'd in a Mortar with Wine. And ſometimes we are obliged to have Recourſe to common *Opiates*, diſſolv'd in *Sage* or *Roſemary* Water; or ſometimes *Saffron* and *Opium:* At other Times we make Uſe of *Fumigations*, of *Opiates*, and *Henbane-Seed*, holding open the Mouth over the hot Vapour: Or elſe we uſe Oil of *Cloves*, *Juniper*, *Roſemary*, *Guajacum*, *Spike*, *&c.* which are mix'd with *Camphore* and *Opium*; as thus: Take Oil of *Cloves*, Two Drops; Camphore, as much; mix them in a Mortar, and with Lint apply them to the Teeth. Or take *Camphore*, half a Scruple; *Opium*, Four Grains; *Spirit* of *Wine*, Two Ounces; Sage-Water, Six Ounces; mix and waſh the Mouth with it hot, and as long as you can detain it. If the Teeth be inclining to a *Caries*, put to them Pills of *Laudanum*, or *Hound's-Tongue*; or mitigate with the following Electuary: Take Roots of *Biſtort* and *Pellitory* of the *Wall* in Powder as you pleaſe, *Burnt-Allum* a little; beat them up together with ſome Honey to an Electuary. It both eaſes the Pain, and kills the Worms in the Teeth: For which likewiſe the following Things are excellent; as *Savine*, *Wormwood*, *Tanſie*, Roots of *Angelica*, *Zedoary-Seed*, to make Gargariſms with. So *Myrrh*, *Aloes*, *Colocynthis*, for Tinctures, to be made with Wines, and to waſh the Mouth

Mouth with it. This tormenting Symptom of the *Tooth-Ach* is in ſome a never-failing Sign of Breeding, ariſing in ſuch from a *Plethora* of Blood, occaſioned from a Retenſion or Stoppage of the Courſe of Nature; for theſe Pains ceaſe generally after little Time, as the other Symptoms of Gravitation, which are very troubleſome in the Beginning of the Conception. But if after the Application of all or moſt of what is here preſcrib'd, the Pain continues ſtill, it will prove the beſt and moſt infallible Way to draw the Teeth.

Of the Stupidneſs or Inſenſibility of the Teeth.

THis Stupidity of the Teeth is call'd by the *Greeks Hæmodia*, and is what we underſtand by the *Teeth being ſet on Edge*, ſo that we cannot chew our Meat without great Trouble; neither are we able to touch them with our Fingers but with abundance of Pain: Therefore *Capivaccius* rightly calls it *Hæmediam Dolorem*. It proceeds from acid and auſtere Things, which conſtringe the Fibres and little Nerves, and make them ſo rigid, that they bind in the Spirits, ſo that their Motion is obſtructed from entring the nervous Ducts by Reaſon of their Tightneſs. Things of this Kind which abound with acid, rough, and auſtere Particles are, *Sloes*, *unripe Grapes*, *Crabs*, *Limes*, and other immature and unripe Fruits. So the Drinking of *prick'd Wine*, *Vinegar*, *Spirits* of *Vitriol* or *Sulphur*; in like Manner *Sugars* ſometimes produce the like Effects, having in its Body an occult Sharpneſs, as is evident from ſweet Liquors being ſo ſubject to turn ſowr. This Diſaffection I have been ſpeaking of in the Teeth ſometimes is occaſioned by Imagination, or an outward Cauſe, as when we ſee ſharp or ſowr Things eat, or hear a grating Sound, as the Scratching of a Plate, or the like, we are moved to a Grinding of the Teeth, and this *Hæmodia*, or *Stupor* of the Teeth, ſhall enſue: Which *Hieronymus Fracaſtorius*, in his Chapter of Sympathy and Antipathy, explains admirably well: *Similiter & ſi acutus valde ſit Sonus, & ſtridulus Applicatio Vim patitur, quaſi in Angulo facta cum Membrano Auditus, quaſi Vitæ offenditur unde contrahitur repente, ac cum ea ſimul & Nervuli quidem uſque ad Radices Dentium, in quem Locum ſubito incidens novus Aer, Horrorem quendam circa Dentes facit:* 'And likewiſe if a Sound 'ſhould be very acute and grating, the Ap-'plication bears the Force of it as if done 'upon a Point; then the Auditory Mem-'brane, as if wounded with the Percuſ-'ſion, is contracted ſuddenly, and with it 'likewiſe the Nerves even to the Roots of 'the Teeth, into which Place a new Modi-'fication of Air falling in ſuddenly, pro-'duces a certain Gnaſhing of the Teeth." But this Misfortune, though it be troubleſome, is not difficult to relieve.

Some cure this with chewing of the moſt juicy Greens, as *Porſlane*, *&c.* the Softneſs of whoſe Juice adhering to the Teeth, takes off the former Acidity. Others cure this with oily and unctuous Medicines, as *Bitter Almonds*, and chewing of Wax. Others with *Liquorice-Roots*, *Filberts*, *Walnuts*, *&c.* Some uſe new or old Cheeſe, or the White of a potch'd Egg; but there are a Thouſand Methods propoſed to ſerve different People upon an Exigency; among which theſe may have a Place: Decoctions of *Sage*, *Bay-Berries*, *Roſemary*, *Juniper*, *Balſam* of *Peru*, *&c.* But the beſt of all is humane Urine, applied warm, or inſtead thereof, a Solution of *Sal-Armoniac*, or other Alkali Salts, with Spirit of Wine: Or a Cure may be effected, if the Teeth be but touch'd with Oil of *Tartar per Deliquium*.

Of foul, rotten, or ſtinking Teeth.

NAture has formed the Teeth *white* and *clean* to be a Beauty to the Face, as they are generally what appear firſt in View in Converſation; for how diſguſtful it is to ſee black or yellow Teeth, or obſerve the Gums and ſome Part of the Teeth loaded with a ſtinking Slime, or tartarous Matter. The moſt common Occaſion of bad Teeth proceeds from Children being neglected, and left to their own Directions what they ſhall eat or drink, ſo as they are generally inclinable to ſweet Things and raw acid Fruits; ſo there are Ten Sets of bad Teeth for One good One, ſetting aſide all thoſe that are otherwiſe deſtroyed by Diſeaſes, as

Scurvy,

Scurvy, *Worms*, *Tooth-Ach*, and then of Courſe the Uſe of hot Oils, Spirits, and the like, which in Proceſs of Time eat away all the Fibres that ſhould ſupport the Teeth, or keep up the Gums, which falling away from them, of Courſe brings them to Decay and Rottenneſs. Beſides the Diſeaſes peculiar to the Teeth, there are ſeveral other Diſeaſes of the Body impair theſe Parts, as the *Cachexia* and *Green-Sickneſs*, where, from the Vapours that ariſe from the Heat of the Stomach, the Teeth are all furr'd up, and in ſome Time decay'd thereby. So in Fevers, when the Patient eats nothing for Three or Four Days, or more ſometimes, the Teeth in that Time contract a large Quantity of mucilaginous Slime upon them, which, together with the Heat and Acidneſs of the *Saliva*, corrupts the Parts.

The common Topicks made Uſe of upon theſe Occaſions are, Bones calcin'd, as of *Hartſhorn*, *&c.* Alabaſter, Pumice-Stone, Coral, Pearl, Crabs-Eyes, Egg-Shells, Teſtaceous Shells, Flints, Brick-Duſt, Burnt-Allum, *&c.* out of which, the beſt *Dentrifices* are made. To which may be added any Perfumes, Balſams, Oils, or the like, and ſo reduced into the fineſt impalpable Powder. Some Perſons depend upon Aſhes of *Roſemary* or *Tobacco* as the greateſt Secret in this Caſe. If there is a Rottenneſs of the Teeth, nothing will do without Spirit of Salt and Spirit of Wine mix'd together with a little Water, or elſe Spirit of *Sulphur* or *Vitriol* in Water.

Of the Looſeneſs and Shedding of the Teeth.

THE Teeth are apt to fall when they have no Adheſion to their *Sockets*, or they are worn away from them. In aſſigning a Cauſe for their Looſeneſs, we muſt have Recourſe either to the Laxity of the Gums, or an Eroſion upon the Part, occaſioned by the vitious Humours; ſo that the Gums cannot be united to the Teeth. The Reaſon is Twofold, which makes them looſe either internal or external. The internal is when the Moiſture of the Part is too much depraved, or the Lymphatick Liquid and *Saliva* is pour'd out too plentifully upon the Roots of the Teeth and Nerves, from whence afterwards they grow ſoft, are relaxed, looſen'd, corroded, and fall out. Thus it happens from the Fumes of *Cinnabar*, a Friction of *Mercury*, which always raiſe a *Ptialiſmus*, relax the Fibres of the Teeth, corrode their Roots, and make them fall out, if not timely prevented. A Looſeneſs of Teeth will follow the Scurvey, with Swelling of the Gums, Corruption, and a Relaxation of the Fibres. From the Fumes of Minerals it is common to *Silver-Smiths*, and other the like Trades. The external Cauſe or Reaſon for Looſeneſs, proceeds only from a violent Contuſion or Stroke upon the Teeth.

To confirm looſe Teeth in their Sockets, it may be proper to carry off the too large Flux of *Lympha* by Catharticks, and to ſtrengthen the Tone of the Parts afterwards by adſtringent Gargariſms made of Plantain, Sage, Myrrh, Prunella, Salt in Claret, or a Decoction of Acorn-Cups, *Balauſtians*, Red Roſe-Buds in Red Wine, or a Liniment of *Dragon's-Blood*, *Acaciæ*, Sloes, Tormentil-Root, Burnt-Allum, Honey of Roſes, *qſ.* Apply this to bind or conſtringe the Gums. Or take *Gum-Lac* half an Ounce, Flowers of *Celandine* one Dram, Spirit of Scurvey-Graſs Two Drams, *miſce*. If from a venereal Cauſe, make a Decoction of *Guajacum* in Wine; then boil it again with a little Myrrh and Maſtich. But the following exceeds all for the Looſeneſs of the Teeth, and to incarnate the Gums: Take Oak-Cups *Drachm.* j. Galls *Drachm. ß.* Burnt-Allum, Juice of *Acaciæ*, of each *Drachm. ß.* Red Roſe-Buds *M.ß.* Myrrh, Mace, Dragons-Blood, of each *Scrupl.* ij. Boil them in a Pint of Claret, and gargle the Mouth.

A Diſſertation of the Nutrition of the Bones; or, An Explication of the Nature and Uſe of the Marrow. By Louis Lemery, *Doctor Regent of the Faculty of Phyſick at* Paris, *and of the Royal Academy of Sciences.*

OF all the Parts of the Body, the Bones are the hardeſt and moſt ſolid. They are made the *Baſis* of the Trunk, and to ſupport all the other Parts, which could never have born that Weight, had it not been for this Solidity which Nature has provided them with. This is a Truth we think our ſelves not obliged to make any further Proof of, no more than we do, that the Bones are ſubject to certain Diſeaſes.

The Hardneſs and Solidity of the Bones ariſes principally from the Earthy Parts of which they are compoſed; not but they contain as much of *Oil*, *Phlegm*, and *volatile Salt*; but theſe Principals are not every where diſperſed in ſuch Quantities, and do not contribute altogether to ſo intimate an Union as the Earthy Parts. If theſe Principles, from the Salts contained in them, be predominant in the Compoſition, they make the Body more ſolid; but if, on the contrary, there is too little Quantity of this Mixture, the Body of the Bone is eaſily reduced to Powder, or at leaſt is more ſubject to break; as it happens to a Bone when the Humidity of it is exhaled before the Fire.

To know what Earthy Parts the Bones have in them, take the large Bone of an Ox, and calcine it entirely, and after Calcination obſerve whether it has not loſt about half of its Weight, which you will know by comparing what remains of the Bone with what is loſt of *Oil*, *Flegm*, and Salt mix'd together, which the Fire has deſtroyed, or in ſome Meaſure exhaled. All the Bones do not afford an equal Quantity of Earth, but give more or leſs, according as they are more or leſs ſolid; for if you calcine (for Example) a Pound of tender cartilaginous Bones, as thoſe of the Ribs, you will not get above Four or Five Ounces of Earth.

The Solidity and Firmneſs of the Bones differ very much according to the different Ages of Life. In the Beginning they are tender and ſoft; afterwards they grow more compact, and in the End acquire the laſt Degree of Solidity and Dryneſs with Age. This different Firmneſs of the Bones agrees perfectly well with their different Uſes or Neceſſities; for firſt it is neceſſary they ſhould be very tender, by reaſon the Fibres and Ligaments for their Support are ſo too; but when the ſame are grown to a certain determinate Size, it is requiſite they ſhould acquire a proportionable Solidity to anſwer the Weight they were deſigned to bear; for as the Parts encreaſe more and more during the Growth of the Body, ſo the ſame Foundation of Strength equivalent to their Burthen, is requiſite to be given to the Bones.

The many *Sinus's* which appear diſtinctly in the *Cranium* of Adults, or grown Perſons, are not more viſible than thoſe of Infants. The Reaſon of that Difference comes from hence: That the Partition of theſe little Cavities are at firſt united in ſome Manner; but from a Proportion of the Extenſion of the Parts of the Bones, the ſame Partitions divide themſelves, and ſtretch out one with the other.

Mr. *Mori*, of the Royal Academy of Sciences, ſhew'd me the *Lower Jaw-Bone* of an old Woman, in which not only the *Alveolæ* were entirely gone, but the very Size or Bulk of the Part was conſiderably waſted: And this is very agreeable to Reaſon, that the bony Fibres being deprived of their Uſe by Reaſon of Age, had denied their Aſſiſtance of Nutriment to the Part; ſo that by Conſequence a Diminution would ſucceed from the Largeneſs of the Cells of the Bones, without Accretion of freſh Juices to ſupply; ſo that by Degrees the Subſtance of the Part muſt wear away, though, in Truth, after a Manner ſcarce perceptible.

As the Solids which compoſe the Bones are liable to a continual Waſte of their Parts, ſo it is neceſſary they ſhould have a ſuitable Nutrition for their Supply: But ſuch a Juice or Fluid that approaches neareſt to the Nature of a proper Nouriſhment for the Bones, has in all Ages been the Subject of Diſpute for the Phyſicians. *Hippo-*

crates, Galen, and with them the moſt celebrated Phyſicians of Antiquity, pretend, that the Nutrition of the Bones was immediately and directly from the Marrow, as that of the Fleſh was from the Blood. *Ariſtotle* and his Followers maintained the contrary; *viz.* that the Marrow ought to be regarded no otherwiſe than as an Excrement of the Bones. Each Party upheld their ſeveral Doctrines which they had laid down; but I hope I may be permitted to ſay, that theſe great Men of Antiquity were none of them capable of deciding the Queſtion: Firſt of all, becauſe they were ignorant, not only of the Circulation of the Blood, but alſo of the Method how that Fluid was diſtributed thro' the whole Subſtance of the Bones and the Body of the Marrow, to convey to each of them the Juices that were neceſſary for their Support, according to the Diſcoveries of the new Anatomy. In the Second Place, becauſe they were little converſant in Chymiſtry, which muſt afford conſiderable Aſſiſtance towards the Diſcovery of the Nature of the particular Fluids of the Body, and their Agreement with ſome Parts more than others.

If one would ſee diſtinctly the Diſtribution of the Blood-Veſſels throughout the whole Subſtance of the Bones, that muſt be done while the Animal is young; for the ſanguiferous Trunks ſuffering little Reſiſtance in their Motion through the ſoft Subſtance of the Parts, ſwell and grow conſiderably by the continual Impulſion of the Blood. But then in Proportion as the Bones acquire more Solidity, they compreſs the Veſſels cloſer, ſo that by Degrees they become much leſs apparent.

The Bones at their full Growth require leſs Nutrition than in their Infancy, not only becauſe they are more ſolid, and waſt leſs of their Subſtance, but becauſe they are in their Growth, and extend their Parts. As in the Courſe of Nature we may obſerve their Motion preciſely from that of the Blood, by a wonderful Kind of Mechaniſm; for at the Perfection of the Parts, the Blood is not conveyed in ſuch Quantities as before.

The Blood Veſſels extend or ſpread themſelves thro' the whole Subſtance of the Bones after the ſame Manner, and perhaps in as large Numbers, as any other Part of the Body; and tho' theſe Veſſels do not appear altogether ſo viſible in the Bones when they have acquired all the Hardneſs they are capable of, nevertheleſs there is no Reaſon to doubt but that the ſame Veſſels are now in Being as was when the Bones were more penetrable and tender. On the breaking of the Bone of an Animal newly killed, ſome ſmall Drops of Blood will appear in the very Subſtance of the Bone: Beſides, it is plainly viſible in the Operation of the *Trepan*, that there is Blood betwixt the two Tables of the Skull or *Cranium*. In ſhort, Nature diffuſes it ſelf ſometimes more plentifully in one Subject than another.

The Blood is carried thro' the Bones by an infinite Number of minute Arteries. Theſe Arteries convey a Juice thro' all the Parts of this Body, which will be more particularly explained by the Nature of its Conſequences. This Juice or Fluid is received by the bony Veſicles, by Reaſon of its Reſemblance to, and Affinity with, the Bones. The Neck and Sides of theſe Veſicles are inſenſibly hardened, and the Juices coagulated, till in the End they acquire all the Solidity and Firmneſs of the Bones.

This Explication is built upon certain and uncontroulable Experience, and of which you can ſuppoſe nothing more ſimple and natural. The only Thing which would engage any Perſon to doubt the Truth of this, is a certain Prejudice in Relation to the Marrow which has been imbibed from Reading the Ancients, and the little Knowledge moſt have in this Subject. Indeed, at firſt View of the Marrow contained in the Bone, one would be apt to think it was the only Nouriſhment proper for thoſe Parts; but perhaps that Prejudice will be ſoon removed, upon examining the Nature and Uſe of that *Juice*.

The *Marrow* is a moſt delicate Fat, encloſed in many fine ſpun membranous Veſicles, communicated one to the other by a certain woven Contexture thro' which the Marrow is filtered. Without examining the Nature and little Affinity there is betwixt this and the Subſtance of the Bones, there is enough to convince us this cannot be the Nouriſhment of the Bone; firſt, becauſe it does not paſs thro' any Veſſels into the Subſtance of the Bone, neither has it any Reſem-

ſemblance with any of the Parts that compoſe that Body, for it is eaſy to prove, that the Fluid which ſuſtains or feeds the Bones and the Marrow are of a quite different Nature.

Galen ſeems to contradict himſelf ſpeaking of the Marrow; for he ſays, that there are Bones which have no viſible Cavities, and are without Marrow; and in another Place pretends that the Marrow is the ſubject Matter for the Nutrition of all the Bones. *Laurentius*, to agree with *Galen* in the ſame Thing, and yet avoid this manifeſt Contradiction, diſtinguiſhes Two Sorts of Marrow: The one, ſays he, is white and thick, and traverſes the Cavity of the Bones; the other is red, and more liquid, and this flows in the little bony Cells. Although this Author gives to both Juices the common Name of Marrow, he is obliged nevertheleſs to make a Difference betwixt them, and perhaps he would have found a great deal more Reſemblance betwixt them, as to their Subſtance and their Uſe, if he had examined them with more Care, which I ſhall do, though I have not the Happineſs to ſpeak the Language of *Galen*, or think exactly as he did.

Theſe Two Liquors, which they confound together, differ nevertheleſs very much in their Taſt, their Subſtance, and their Uſes; for thoſe who take Notice of the Difference of their Taſt, it is to convince them, by comparing the Juice drawn from the Subſtance of certain tender Bones, with the Marrow contained in the Cavity of the Bones. They may perceive by this, that the Marrow, properly ſpeaking, is indeed a more agreeable Fat than others, becauſe it contains a very fine Oil, more delicate, and perhaps abounding with a larger Quantity of volatile Salts. But the Marrow excites to vomit, as other Fats, by the great Plenty of its oily Particles, which are proper to produce that Effect. This Juice of the Bones, on the contrary, reſembles by its Taſt the Gravy of Meat, which affords a ſweet and agreeable Savour, without occaſioning the Stomach to nauſeate, as is remarkable when we eat Marrow. After all, I believe there is no more Difference betwixt the Juice of the Bones and the Marrow, by the Reſemblance of the Taſt and Subſtance, than there is betwixt the Gravy of Meat and the Meat it ſelf; which Truth will appear clearly by the following Experiment.

Take an Earthen Veſſel, in which put Bones with the Marrow broke to Pieces; put to the ſame a certain Quantity of Water; boil this for ſome Hours together; then take the Veſſel from the Fire, and obſerve that the Liquor contains in it Two Sorts of Suſtances; one is an Oil, ſwimming on the Top, as certain Oils do on common Water: It is coagulated when the boiled Liquor is cold. The other Part remains in the Liquor, as it were a Mucilage, reſembling it in Conſiſtence, and the ſame in Taſt as the Gelly of Meat or Hartſhorn. That Part is ſtill thicker and more mucilaginous when it is boiled again, and ſet to cool.

I ſay, the Firſt Part is no other than the *Marrow*, as well that which is in the Cavity of the Bones, as in the Parts which are ſolid; and this is the oily Subſtance which we obſerve in the foregoing Experiment. The Second Sort I call the *nutritious Juice* of the Bones: Firſt, becauſe it is generally found in all Sorts of Bones; and Secondly, becauſe it is ſeated in the very Subſtance of the Bone, and conſequently is its direct and immediate Nouriſhment. And in the Third Place, becauſe it is of a Conſiſtence and Quality proper for Nutrition, ſuch as the Marrow cannot be. In ſhort, this *Juice* is the gluey Part of the *viſcous Limpha*, proper to agglutinate the ſolid Parts, and to harden them. The eſſential Character of a nutritious Juice is without any Diſpute to be a Liquor capable of affording Nouriſhment; and this Juice is proved to be of a due Conſiſtence and Solidity. As for the *Marrow*, I muſt compare it, when in the Veſicles, to Oil that is coagulated, and that will eaſily flow with the ſmalleſt Heat: So that a bare Inſpection into the *Marrow*, and this Juice that enters into the Body of the Bone, ſhews ſufficiently the Difference of theſe Two Liquors, in Relation to the Subſtance and their Uſes: The one, by its eaſie Manner of thickening the fluid, ſo as to become nutrimental to the Bones; the other, by the Fluidity and Softneſs of the Parts, contribute to the Pliantneſs and Activity of the ſaid Bones, as will be explained more amply by the by.

I cannot tell how the principle Foundation of that which nouriſhes the Bone comes to be an Extract of that which is the moſt delicate and fineſt oily Portion of the Blood. Neither is it conceivable to me, that an Oil ſo fine and ſo delicate can be the Nouriſhment of Parts ſo earthy and ſo groſs as the Bones. And it is much leſs ſo, if we examine the Nature of Fat in the groſſeſt Bodies, we may diſcover it eaſie enough that it carries not with it the eſſential Character of a nutritious Juice any more than the Marrow. Some Anatomiſts have ſtrangely deceived themſelves, who thought or imagined that the *Fat* contained in the Cells of the adipous Membranes was of Uſe upon Famines or Want of Food, to ſupply the Body with Nutrition, by being diſſolved and returned into the Blood-Veſſels, and ſo diſtributed through the whole Body. If this Opinion was true, fat People have a rare Stock of nutritious Juices laid by them againſt they fall into any long Fit of Sickneſs. But on the contrary, the principal Uſes of Fat are, Firſt, to maintain and coacervate the Heat of the Body; as we ſee People who have more of it are leſs ſenſible of Cold than others: The Second is, to moiſten and lubricate the Muſcles, for without this they would grow dry by continual Motion. In the Third Place, to hinder the Skin from Wrinkles, an Inconvenience which commonly attends lean Perſons.

Although the *Marrow* affords no nutritious Juice to the Bones, although it is of no great Uſe and Aſſiſtance to them at their Junctures, yet it is of a fine delicate Subſtance, that makes their Parts unite with greater Activity and Warmth, and eaſily inſinuates it ſelf into the bony Fibres, which it moiſtens by its Oilineſs, and makes more ſupple and leſs brittle than they would be without it. The *Marrow*, as is obſerved by Anatomiſts, ſpreads it ſelf with little Heat among all the Fibres of the Bones; as is obſerved in Blanching of Bones for a Skeleton, the leaſt Heat will exhale the Marrow to the external Parts.

All the Bones do not contain Marrow in them, but ſuch as are ſubject to the great Motions of the Body, and whoſe Fibres would be too dry to perform any Thing with Agility, if they were not continually lubricated. 'Tis for this Reaſon that Nature has appointed Fat in certain Parts of the Body, which lie liable to violent Motions. So the Marrow is wholly deſtin'd for the Service of the Bones, by entring the Fibres of them, moiſtening their Motions, which would be difficult and painful without this unctuous Liquor, which gains an eaſie Admittance into the Intervals of the Fibres. Hence it is, if any Animal continues to move a long Time together without Reſt, the whole Magazine or Stock of Marrow will be ſpent, or at leaſt ſo conſiderably, that the whole fluid Part is drain'd off. This is exemplified by ocular Demonſtration in Sheep, which if kill'd inſtantly after they have been driven far, and the Bones examined, you will ſcarce perceive any Marrow at all; whereas on the contrary, if the ſame Animals be permitted to reſt ſome Time in the Fold, ſo that they can recruit, the Bones will be fill'd with Marrow.

A further Account of the Marrow, and its Uſes. From Dr. Clopton Havers's Oſteologia Nova.

THE Cavities which Nature has formed within the Bones are neither empty or uſeleſs Vacancies, nor fill'd with Lumber, and contemptible, but convenient Repoſitories for a curious and refin'd Subſtance, neceſſary for the Service of thoſe Parts that contain it, which is call'd the *Marrow*. The Nature of the Matter which is here ſeparated and depoſited, and immediately ſerviceable to the Bones, is wholly oleaginous: However the whole Maſs or Body of the *Medulla* conſiſts of ſeveral Parts, to wit, of Blood-Veſſels, both Veins and Arteries, of Glandules, and containing Parts, and the oily Part which is contained in them.

It has Blood-Veſſels proper to it ſelf. The Artery is ſometimes ſingle; ſometimes there are Two or Three, and in ſome Bones, as particularly in ſome of the Ribs, they exceed that Number, having every one of them a diſtinct *Foramen* formed in the Side of the Bone, for their Paſſage into the Cavities. It paſſes through theſe *Foramina* without any Diviſion or Ramification; for

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I could never obſerve that any of them ſent forth any Twigs into the Subſtance of the Bone for its Nouriſhment, but were deſigned ſolely for the Marrow: Which is contrary to Mr. *Lemery*'s *Opinion, who is a Man of good Learning and ſolid Reaſoning.* After it comes into the large Cavity, or into the leſſer Caverns, when the Bones are ſpongy, it is commonly divided into Two, one aſcending towards one Extremity, and the other deſcending towards the other, both of which in their whole Tendency are ſo ramified, as to give a Twig to every Veſicle that performs the Office of a Glandule. As for the Veins, they run from the Termination of the Artery; ſome all along within the *Marrow* to the *Foramen* through which the Artery enters, and fall into one large Channel, which paſſes through the ſame *Foramen*; others tend to the *Superficies* of the *Marrow*, whereof ſome which are minute paſs immediately through the Membrane, and penetrate into the Side of the Bone, which we muſt ſuppoſe diſcharge themſelves either into ſome Vein of the *Periоſteum*, if they proceed ſo far, or into ſome of them which are in the Subſtance of the Bone, and belong to the nutritious Arteries: Others run upon the *Superficies* of the *Marrow*, between that and the Membrane, which fall at laſt into that larger Veſſel which paſſes out by the *Foramen* of the Artery. Where there are Two or more conſpicuous Paſſages, it is probable that ſometimes the Vein may paſs ſingly through one, and the Artery through the other, though I have not yet obſerved it to be ſo.

The Secretory Organs are ſmall *Veſiculous Glandules*, which this Author takes to be containing Parts, and continually kept full by the Oil, which they themſelves ſeparate: But before he gives an Account of that, he takes notice of a common containing Part inveſting the whole *Medulla.* The oily therefore, the veſiculous and vaſculous Part of the Marrow, are all contained in one common thin and tender Membrane, tranſparent as Glaſs, which inveſts that Part which lies in the bony Cells, as well as that which fills the larger Cavities. The Origine of this Membrane is certainly from the Blood-Veſſels: For here we have nothing elſe, no other Membrane, no Nerves, no Tendinous or Muſcular Fibres, from whence we can ſuppoſe it to be derived. Neither does he think it is from all the Blood-Veſſels, but only from the Artery; nor from all the Coats of the Artery, but from the exterior only; that it is an Expanſion and an Elongation of the Fibres of this Coat. It is ſo thin, that it does not ſeem to be made of the Fibres of more, or has the leaſt Reſemblance to any other; but it is plainly a *Reticulum*, or fine Net, like the Texture of that. It ſeems in many Places to be red, as if it had a great Number of Blood-Veſſels; but this is not occaſioned by Veſſels, or Blood of its own, but ſome of the Medullary Veins running upon the *Superficies* of the Marrow which lies under it, by Reaſon of its Tranſparency, make it ſeem to retain that Colour, which it only tranſmits. One cannot always ſeparate the Membrane from the Veſſels which communicated that Colour to it, eſpecially if ſoft, for then they will riſe with it.

This Membrane adheres to the Bone, not only by thoſe ſmall Veins which are continued from one into the other likewiſe by inſinuating it ſelf into the tranſverſe Pores of the Firſt internal *Lamel*, and that (as I ſuppoſe) for the better Paſſage of the Medullary Oil through one into the other. This is certain, that it has Pores by which the Oil flows through it into the Bone it ſelf, which it is reaſonable to think are formed in thoſe Parts of the Membrane which lie into the Pores of the Firſt Plate, by which one does more conveniently and certainly receive it from the other. Neither can it ſeem ſtrange, that the Oil ſhould have its Egreſs after it is ſeparated by the Glands through Pores form'd in this Membrane, when we conſider that it is not an unparallel'd Caſe; but the Sweat, after it is ſeparated by the cutaneous Glands, paſſes through the *Cuticula* by ſuch Pores. By the Elevation or Protruſion of this Membrane in ſeveral Places, to inſinuate it ſelf ſome little Way into the tranſverſe Pores on the Inſide of the Bone, are form'd little round Protuberancies, which render the Surface of the Marrow unequal.

The Medullary Oil which is contained in this Membrane, does not lie all confuſed and undiſtinguiſhed in that Space which the common

common Membrane circumſcribes, but there are Diviſions and Subdiviſions, and in the Membranous Bags and in theſe Bags are *Veſiculæ*, or little Bladders. Theſe Bags or Lobules made up of ſeveral *Veſiculæ* are not all of the ſame Figure, nor of the ſame Capacity, even in a large Maſs of Marrow; and for thoſe which fill the ſmall Cavities, it is plain they are variouſly figurated, and different in their Extenſion, as the Cavities themſelves are ſo; and in ſome of the ſimple Caverns which are very ſmall, that which fills them hardly deſerves the Name of a Bag, for in ſome there cannot be more than Two or Three *Veſiculæ*.

The *Veſiculæ* are ſmall Glandular Bladders, deſigned for the Separation of the Medullary Oil from the Maſs of Blood, and for the Reception of it. In that Part of the Marrow where the Oil is fluid and clear, they are to look to very much like the veſiculous Subſtance of the Lungs when they are blown up, but that the *Veſiculæ* are not ſo large. In a ſmall Piece of the *Medulla*, where the Oil is indurated, they repreſent, when they are viewed with a Microſcope, a Cluſter of ſmall Pearl ſticking one to another. In a humane Bone, which was preſerved till the Oil was evaporated, theſe *Veſiculæ*, when dry, appeared like a Sponge. The Medullary Oil being contained in ſeveral ſmall Veſicles, from hence it comes to paſs, that if any one of the Bags be open'd, it does not preſently empty it ſelf; the Medullary Oil does not all guſh out together, but ſtills forth in ſmall Quantities; that it is ſome Time before it flows all out; nay, if the Bag be gently preſs'd, ſo as not to break the *Veſiculæ*, it empties it ſelf but gradually, and that becauſe after the Membrane of the larger Bag is broken, the Medullary Oil is ſtill contained within the *Veſiculæ*, out of which, whilſt they are entire, but ſuch a Quantity of it flows forth at a Time as their Pores will permit to paſs through them.

They ſeem to have Pores or immediate Paſſages out of one into another, and ſo do the Bags, by which the Oil has a free Courſe to the Joints and Subſtance of the Bone, for whoſe Benefit it was deſigned, even from the middle Part of that Maſs which fills the larger Cavities, and lies at ſome Diſtance from the Side of the Bone, as well as from the leſſer Cells; and therefore in melting of a large Piece of the hardeſt *Marrow* over the Fire, the Oil will by Degrees all drop away, and leave the Bags and *Veſiculæ* empty; which ſhews ſome Paſſages from the internal Part to the *Superficies*.

The Bags and glandular Veſicles are without Doubt propagated from the Blood-Veſſels, ſince, as I ſaid of the common Membrane, there are no other Parts within the Cavities from whence they can be derived; and they ſeem to be not only particularly from the Arteries, but from their exterior Coat. This membranous Subſtance is in the ſame Manner like the common Membrane, tranſparent, and their Texture ſeems to be every Way the ſame. Beſides the Preſſure of the medullary Oil, which is continually ſupplied upon that which was before ſeparated, and depoſited in the Veſicles, to drive it on towards the Subſtance of the Bones, and towards the Joints in ſome of them, we have ſome Reaſon to think, that when the *Veſiculæ* and larger Bags are fill'd to a convenient Diſtention, they contract themſelves, as the Fibres of the Bladder and ſuch membranous Cavities evidently do upon the ſame Occaſion, whereby being like a Sponge compreſs'd, the Oil is ſqueezed and forc'd out of one Veſicle and out of one Bag into another ſucceſſively, whereby that Part which is contained in the Veſicles that lie next the Membrane is driven through it, and into the tranſverſe Pores of the Firſt internal Plate, and that which was more remote is carried on towards it, and ſupplies the Place of what is removed.

One Thing remains here to be given an Account of, and that is the Paſſage of the medullary Oil to the Joints. The Manner of its Paſſing whilſt it is within the Bags and *Veſicles* has been explained: But what Contrivance there is for its Exit out of the Bone, and its Flowing into the Interſtices of the Joints, is next to be conſidered, as it is evident that it has a Paſſage into them: For if any Joint be preſerved entire till all the Mucilage is waſted, there is to be found even in the Fingers an Oil tranſuded and ſticking to the Ends of the Bones, which is ſupplied from their Cavities after a Man is dead, where even Death it ſelf leaves a Stock to

to maintain the Current of it into the Joints, whereas the Separation and Supply of the Mucilage ceaſes as ſoon as the Circulation of the Blood is ſtop'd, and that which is left in the Joint is quickly evaporated, or diſappears ſome other Way. For this End there are Pores or Paſſages formed both at the Extremity of the Bone, and in the *Sinuſſes* of it, which are on one Side. Thoſe which are at the very End, which ſeem cartilaginous, are very ſmall but numerous, which in moſt Bones it is very difficult to diſcover. Some of the Paſſages in ſome *Sinuſſes* are very conſpicuous, particularly in the Cavity on the hinder Part of the *Os Femoris*, and on the hinder Part of the *Trochlea* of the Shoulder-Bone, there are in moſt *Skeletons* ſeveral, ſometimes Six or Seven: And in the ſame Cavity in the *Os Humeri* of a Horſe, there have been Eight or Nine of theſe Paſſages found pretty large, with ſeveral others, which were viſible to the naked Eye. Now by theſe Pores, the medullary Oil ſeparated in the Cavities flows into the Duct, and by that into the Interſtice of the Joint.

The Paſſage of this Duct where it opens into the Joint, is in ſome Animals very large. In a Calf where it was ſingle, it has been obſerved to be larger than that through which the medullary Veſſels paſſed into the Cavity. And in fattened Beaſts, ſo without doubt in ſome Men who are very corpulent, there lies often over it ſomething like a fat Gland, fixed as it were by a Root into this Paſſage; for as the adipoſe Glands between the Muſcles, ſo the Veſicles of the Marrow may often ſupply a greater Quantity of Oil than is expended, and where the Animal is fatted, and little exerciſed in Motion, as thoſe which are deſigned for Slaughter are excuſed from Labour, there is more ſupplied, and leſs made uſe of, than in ſome others; ſo that it is not ſtrange to find ſome of it ſticking upon the Bone, and a Superfluity of it even in the Joint.

In the next Place, ſays our Author, I ſhall give ſome Account of the Uſes of the *Marrow*. The Uſes of it, I ſay, becauſe it ſerves for more than one, though that can be none of them which Authors ſeem to aſcribe to it, when they make the medullary Subſtance which lies between the two Tables of the Skull to ſerve for the Nouriſhment of it; for beſides that the Bones have evidently Blood-Veſſels deſigned for their Accretion, which properly belong to their Subſtance, and are no Ways concerned with the *Marrow*. To any one that conſiders the Nature of the *Medulla*, that it is an Oil, it will plainly appear how uncapable it is of being converted into ſo ſolid a Subſtance as that of the Bone. Yet if they will ſuppoſe Nutrition to be only a Supply of volatile and fluid Matter, to maintain the Fulneſs, and to preſerve the Tone and Temperament of the containing Parts, the medullary Oil may be ſaid to be concerned in their Nutrition, as it is continually ſupplied to repair the Loſs of that Oil which is expended.

The Uſe of it is in the firſt Place general, and common to all the Bones, and to the whole of every one of them; and ſecondly, more particular to ſome Parts of ſome of them. It oils the whole Subſtance of every Bone, and by its Unctuoſity preſerves them in a due Temperament. Their Parts are naturally dry in themſelves, and when they obtain too great a Degree of Siccity, they are more fragil, and apt to be broken by any Violence; and not only ſo, but we find how ſoon the thin Part of the *Scapula*, where there is no *Medulla*, will, without any Violence, crack meerly by its own Dryneſs, when it is expoſed to the Air: So that it was neceſſary for their Security againſt Fiſſures and Fractures, that they ſhould be defended by ſuch a Matter as may help to retund the Violence of thoſe Accidents which are apt to injure them, and ſo mollify their Parts, as to make them capable of yielding a little to thoſe Preſſures, and that Force, which would otherwiſe be more eaſily, more inevitably, and more ſenſibly injurious.

Beſides this general Uſe of the *Marrow*, the Service of it is more particular to the Extremities of thoſe Bones which are articulated. Firſt for their *Lubrication*: To fit them for the great and neceſſary Buſineſs of Motion, to preſerve them always in a Condition fit for it, and to make them more ready to alter their Poſition when there is Occaſion. It is true, the Ends of theſe Bones which are articulated are very ſmooth; but yet

Yet if they were dry, they would not with that Readineſs and Facility obey the Commands of thoſe Muſcles which move them. Wherefore Nature has taken Care to lubricate them with a ſlippery Oil, to which when it flows into the Joint is added a mucilaginous Liquor ſeparated by peculiar Glands ſeated in the Articulations, and from the Mixture of thoſe two, an Oil and a Mucilage, is made a Compoſition ſo fit for this Deſign, that nothing taken from the vaſt Stock of Nature ſeems comparable to it.

Secondly, the medullary Oil, in Conjunction with a Mucilage, preſerves the Ends of the Bones, which are articulated from an Incaleſcence, from contracting an inordinate Heat by their Motions, which would otherwiſe be the Effect of them, eſpecially when they are very quick and violent, and long continued. It is impoſſible that Two Bodies ſo ſolid as the Bones in ſome Parts are, and the Extremities of thoſe which are articulated, would be without the Benefit of ſuch a Matter as both mollifies them, and intervenes ſo as to keep them from an immediate Contact, ſhould be violently mov'd and rubbed one againſt another, without creating a great Heat. This every Coachman and Carman is ſenſible of, and therefore they have their Oil and Mucilage, a Compoſition in which they imitate this of Nature, that is, a Mixture of Greaſe and Tar, with which they beſmear the Inſide of the Naves of their Wheels, and the Extremities of the Axis upon which they move, without the Benefit of which, the ſwift Rotation of one about the other produces a Heat, and that ſometimes ſo intenſe as to ſet them on Fire. And if there had not been a Proviſion in the Joints againſt ſuch a preternatural Incaleſcence upon their violent Motion, they would have made a ſlothful World, and have confined us to ſlow and deliberate Movements, even when there were the moſt urgent and haſty Occaſions to quicken us.

Thirdly, it was farther neceſſary, that the Bones ſhould be oiled and moiſtened with ſomething of this Nature in their Joints, to prevent their Attrition or Wearing by Rubbing one upon another, muſt inevitably be mutually injurious, and ſome of the Parts muſt be worn off on both Sides; ſo that the Contrivance of Nature to adapt one Bone to another in all the Articulations, to fit them for an eaſy Motion; and that Variation of their Poſition which is requiſite in every Joint, how admirable ſoever it might ſeem at firſt, would not be long uſeful, but the ſtirring Part of Mankind would ſoon find themſelves fitter for an Hoſpital than for Action and the Purſuit of Buſineſs.

Thus it appears how beneficial and abſolutely neceſſary the medullary Oil is to the Bones; but the Uſe of it extends it ſelf beyond thoſe Parts; firſt to the Ligaments which tie them, that are articulated together: Theſe it preſerves from Dryneſs and Rigidity, it keeps them pliable and ready to conform to all the Motions and Poſtures of that moveable Part to which they appertain. Were they not thus oiled, we may eaſily be ſenſible how different their Temper would be from what it now is, from the Rigidity which they contract when they are laid in the Sun and dry'd. And why may we not alſo ſuppoſe that it is as uſeful, and for the ſame Reaſon as neceſſary to theſe Parts, as Oil to Fiddle-ſtrings, which the Muſicians make Uſe of to preſerve them from their Aptitude to break, which otherwiſe they will have when they are much extended, ſo to ſecure theſe Ligaments from a Diſruption, which, as ſtrong as they ſeem to be, they would be in Danger of upon a great and ſudden Stretch or Contortion, if they were dry? They are oiled and moiſtened with this Mixture of the medullary Oil and the Mucilage.

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An Abſtract of Dr. *Clopton Havers, S. Reg. Soc. Oſteologia Nova*: Or ſome new Obſervations of the Bones, and the Parts belonging to them, with their Accretion, Nutrition, *&c.* Communicated to the Royal Society in ſeveral Diſcourſes. With Additions from *D. Clericus* and *J. Margetus*, who publiſhed it in *Latin*, with Notes.

The firſt Diſcourſe, of the Manner of Generation, of the Membrane, the Nature, conſtituent Parts, and internal Structure of the Bones: Read Auguſt 7. *and* October 23. 1699.

The Manner of Generation.

THE Ancients had a Notion, that the *Semen* of the Man was Part of the Conception, that the Woman had a true Seed, and that the Mixture of theſe two Seeds was the material Cauſe of the Bones, as of all the other Parts unto which they gave the Name of *Spermatick*. But ſince *de Graef* has diſcovered to us Neſts of Eggs in viviparous Animals, and that in the Bellies of Women, this Opinion is quite exploded.

The Original therefore of the higheſt Animal being from an Egg, it ſeems moſt probable that the Bones, as well as all the other Parts, are by the admirable Stenography of Divine Providence delineated in the Egg whilſt it is in the *Ovarium*, and before the Female is impregnated. That ſo many Parts ſhould be deſcribed within the Compaſs of ſo ſmall a Body, will not appear improbable, if we conſider the Minuteneſs of ſome *Animalcula*, which nevertheleſs conſiſt of Spirits, Humours, and a Multiplicity of Organical Parts.

If an Analogy may be ſuppoſed between theſe Eggs and the Seeds of Plants, the Obſervations which are to be made of the one, may direct us in our Hypotheſis concerning the other; when we ſee the Rudiments, the Leaves, the Stem, and Radicle of a Plant, are to be found in the Seed, before it falls into the Womb of the Earth, and under the prolific Influences of the Heavens. 'Tis true, the Parts of an Animal, whilſt as yet incloſed within the Egg, muſt of Neceſſity be undiſtinguiſhable to our Sight, until and for ſome Time after the vivifick Spirit of the *Semen* has put the fluid and volatile Particles into Motion; after the firſt efficacious Impreſſion of which, Generation ſeems to be carried on in this Manner; to wit, Thoſe Parts that are the firſt Principles of the Humours, and all others that are diſpoſed for an Activity, being by this Motion put into a Fermentation, are rarified and expanded, and conſequently requiring a larger Space than that was capable of containing them, whilſt they by their natural Diſpoſition might as yet be retained within the Magnitude of the Egg before Impregnation, now begin to dilate the Cavities and Veſſels which contain them. Being once put into a Motion, though at firſt it be languid, and proportionate to the Tone of thoſe Parts which are afterwards ſolid, they naturally endeavour to perſiſt in it: And tho' their firſt natural Tendency upon this Motion can't be thought the ſame in all the Parts that are thus agitated, yet by the Contraction and Pulſe of the Heart, it is directed in all of them to the ſame general *Terminus ad quem*, *i. e.* the Veins: For whether this Fermentaion be excited in all thoſe Particles at once which afterwards are turned into Humours, and exalted into Spirits, or whether

it has its firſt Beginning in the *Punctum Saliens*, which is afterwards the Heart, it will become the ſame Thing.

If the Fermentation be excited in all that Matter contained in the Ventricles of the Heart, and all the arterial Channels at the ſame Time, there will follow a great Variety in the Tendencies of the Motion of thoſe Particles; nevertheleſs the Heart will ſtill have the chief Direction; ſo that by its Pulſe, and the Power and Motion of thoſe Particles that are immediately propelled by it, the Courſe and Tendency of all the reſt is ordered ſo, as that at laſt they all move towards the Extremities of the Arteries, and to the Veins which ſucceed them.

But in caſe the ſaid Fermentation be excited only in that Matter which lies within the Cavities of the Heart, as I am apt to think that the Veſſel which afterwards appears to be the Umbylical Vein, has its Courſe always towards, and terminates in the Membrane of the *Ovarium*, where there is a Pore thro' which the ſpirituous fermentative Particles of the *Semen* entring the ſmall Duct, is carried to both Ventricles of the Heart in a Manner at the ſame Time; ſo that whilſt one Part of them puts in Motion that Matter which was contained in the Right Ventricle, the other Part invigorates and actuates that which lay in the Left. To this End, Nature ſeems to have made the *Foramen Ovale* in a *Fœtus*, by which there is a Paſſage from the *Vena Cava* into the *Vena Pulmonaris*, and ſo into the Left Ventricle, without ever coming into the Right, that ſome Portion of the Seminal Spirit may be immediately conveyed to the Left Ventricle, and communicate a Motion to the Particles contained in it, before it has ſpent Part of its Vigour by acting upon other Matter.

Suppoſing the Fermentation to be thus partial, we may conceive how the Particles in both the Ventricles being rarified and expanded dilate them, and ſo conſtrain the Fibres of the Heart to a Renitency and Contraction, which occaſions the Pulſe. By this Contraction, and the Expulſion of ſome of the Particles lodged within the Ventricles, they not only communicate a Motion ſucceſſively to the Parts contained in the *Aorta*, and all the Veſſels which are derived from it, but alſo determine their Motion towards the Veins: And thus the fluid Parts begin their Circulation; for the Arteries, by the Motion and Expanſion of theſe Particles, being diſtended, by this Expanſion, and the Preſſure of that Matter which is in Circulation, the Extremities of the Veſſels, and the Paſſages into the Veins which begin where they end will be opened, and conſequently the circulatory Motion of the Blood will be carried forwards into the Venoſe Channels.

The putting of the Blood into a due Courſe of Circulation, as it was abſolutely neceſſary to the Life and regular Encreaſe of the *Fœtus*, as well as in the whole Courſe of our Lives; ſo there ſeems to be a peculiar Contrivance for the better Accompliſhment of this Deſign in the *Canalis Arterioſus*, by which the Blood, that after the Birth of the *Fœtus* is driven out of one Ventricle into the other thro' the Lungs, at this Time paſſes directly out of the Right into the *Aorta*; and this Ventricle, which, after the Excluſion of the *Fœtus*, neither adds to nor directs the Motion of the Blood in the great Artery, does evidently, whilſt the *Fœtus* remains in the *Matrix*, conſpire with the Left in the Agitation of that Matter which is in the *Aorta*; and by the Mediation of theſe Particles, which it immediately preſſes forward, drives it on in the arterial Channels as well as the Left Ventricle does.

The Reaſon of the Courſe of the Blood being diverted from the Lungs, is gentrally ſuppoſed to be the Want of Reſpiration of the *Fœtus* in the Womb. But this ſeems to be no ſufficient Reaſon; for tho' it is not neceſſary that the Blood ſhould circulate thro' the Lungs upon Account of Reſpiration, nevertheleſs it would neither be impoſſible nor inconvenient to have its Courſe thro' them before the Birth of the *Fœtus*, there being the ſame Pneumonick Veſſels before as after the Birth; and tho' the Lungs do always ſubſide, they do the ſame in Expiration; nay, the Paſſage thro' theſe Veſſels ſeems more free whilſt the Lungs ſubſide than when they are inflated, and all the *Bronchia* and Veſicles diſtended, when the Blood-Veſſels muſt of Neceſſity ſuffer a greater Compreſſion. But ſuppoſing that by the Defect of Reſpiration the Blood could not have a free Paſſage thro' the Lungs of the *Fœtus*,

Fœtus, yet from thence no Inference can be made, that the Right Ventricle muſt propel the Matter from its Cavity into the *Aorta*, and not carry it into the Left by ſome ſuch Opening as the *Foramen Ovale*: So that we may rationally conclude, there was this Deſign to make both the Ventricles conſpire in the Determination of the Motion of the Particles, which are yet to be ſettled in a due Courſe to the Veins, and to forward them thro' all the Stages of Circulation.

As the Extremities of the Arteries are opened by the Expanſion and direct Preſſure of the Particles that were within them; ſo the Pores of the Glandules, whether ſeated in the Sides or at the Extremities of the Arteries, which were cloſed before, will be dilated, and enabled to perform Secretions. Then the Spirits are ſeparated by the Brain, and this Habitation of the Soul being ſufficiently furniſhed with Spirits to eradicate the *Syſtema Alveoſum*, then probably may be the Time when the Soul takes Poſſeſſion in the *Fœtus*.

Among the reſt, the nutritious Glandules beginning to perform their Function, by imparting to the Bones, and all the ſolid Parts, a continual Supply of ſuch Particles as are conformable to their own Nature, and adapted to be apponed to them for their Increaſe; and as the Vigour and Preſſure of the Spirits augments, and forces theſe Particles cloſer to one another, the Parts begin to ſhew ſome Solidity, to diſcover their Nature, and become apparently diſtinct. This *Hypotheſis* does give us, doubtleſs, a more perſpicuous and more intelligible Notion of the Manner of Generation, and the Effects the Seed produces in the *Ovum*, than what has been attributed to that *Plaſtick Power* pretended to be in the Seed of the Male, and to form the Parts of an Animal from an undigeſted *Chaos*. But I paſs off from theſe Conjectures to the Conſideration of ſuch Matters as afford us a much fairer Proſpect of Certainty in Relation to *Oſteology*, or the Doctrine of the Bones, and begin with the *Perioſteum*, being that Part which firſt of all preſents it ſelf to our View.

Of the Perioſteum.

THis is a thick, tranſparent Membrane, compoſed of moſt minute and curious Threads, endued with an acute Senſe, and expanded over the Bones. Its Fibres are not interwoven one within another, but placed in ſeveral Series one over the other. As it is thicker in ſome Parts than in others, ſo it is leſs tranſparent there. In ſome Places its Surface is expoſed fairly to our View, *viz.* where no Muſcles or their Tendons have their Originations or immediate Inſertions. Every where elſe there are ſome Filaments inſerted into it from the Membrane of the Muſcles. Where we may obſerve, that tho' it is not exactly ſmooth, yet it is more equal than on that Side which is next to the Bone, where it has various Inequalities in the Form of Ridges, ſmall Prominencies, Mole-hills, *&c.* which, to ſpeak briefly, are in their Figures anſwerable to ſome ſuperficial Cavities of the Bones, of which I ſhall ſpeak hereafter. It has alſo its Veins and Arteries, which are conſpicuous in the *Perioſteum* of large Beaſts; but they have nothing in them peculiar, that is worthy our particular Obſervation.

Anatomiſts have not concerned themſelves ſo much about the Origine of this Membrane, as generally they do about the *Pleura* and *Peritonæum*. Thus much only may be gathered from ſome few among ſo many of them, that the *Perioſteum* of the *Cranium* is from the *Dura Mater*, and that of other Bones from the Fibres of the Muſcles. But it being a Membrane common to the Bones, it ſeems not reaſonable that in one Place it ſhould have an Original ſo different from it ſelf in another; ſeeing that there are Muſcles as well about the Head as in other Parts from which it might be produced. Upon the ſtricteſt Examination I was able to make of this Membrane, I find, that the Fibres whereof it conſiſts are every where of two Sorts; ſome of them being derived from the *Dura Mater*, others from the Fibres of the *Muſcles*. That the *Perioſteum* of the *Cranium* is derived from the Brain, is apparent, not only from that they are united, and continued from the other thro' the Sutures, in a *Fœtus*, and new-born Infants: but alſo that the *Dura Mater* paſſes out of the *Cranium* at other Places; as be-

tween the *Os Sphænoides* and the *Os Petroſum*, ſo between the *Os Petroſum* and the *Os Occipitis*, which is the Reaſon why it adheres ſo firmly to that Part of the *Cranium*. When it is got out beyond the Bones, between which it is double, it ſpreads it ſelf both Ways over the Bones, *viz.* one Part one Way, and the other another. As the *Pericranium*, which I ſuppoſe to be nothing elſe than the *Perioſteum* of the *Cranium*, owes the Origin of one Series of its Fibres to the *Dura Mater*, ſo does the *Perioſteum* in all other Parts. Hence it is, that in that Part of this Membrane which lies cloſe to the Bone there are every where a Set of Fibres, whoſe Tendency is direct from one End of the Bone to the other, without that Variety in their Poſition which is frequently ſeen in thoſe Threads that are propagated from the Muſcles. This will ſeem perhaps improbable, conſidering that though the *Dura Mater* may be continued from one Bone to another in the *Pericranium* by the Sutures, yet where the Bones are diſtinguiſh'd by apparent Interſtices, and when the Membrane which lies over thoſe Interſtices is no Continuation of the *Perioſteum*, the Courſe of thoſe Fibres which are derived from the exterior Membrane of the Brain muſt be cut off, and conſequently the *Perioſteum* muſt owe its Origine to ſomething elſe: But when, upon a ſtrict View and Examination, I obſerved a Continuation of theſe Threads running upon the Ligaments of the Bones, it was no difficult Matter to find out, that by this Means they proceed from one articulated Bone to another.

Beſides theſe *Filaments* ariſing from the *Dura Mater*, which make that Part of the *Perioſteum* which is next to the Bone, there is another Set of Fibres, derived from the Muſcles and Tendons, which accede to it in every Part as it proceeds. The Origin of theſe is eaſily diſcoverable in ſome Parts, eſpecially upon the Bones of large Animals, for by taking one of the exterior Fibres of a Muſcle, and ſeparating of it gradually, it not only leads us to the *Perioſteum*, but I have traced ſome of them a good Way upon this Membrane, where its Surface has been clear of the fleſhy Fibres.

Hence it is, that the Courſe of the Fibres in the *Perioſteum* is not the ſame in all of them; for thoſe that owe their Origin to the *Dura Mater* run every where parallel, and their Tendency is from one Extremity of the Bone to the other: But thoſe that are propagated from the Muſcles, or their Tendons, are not always the ſame in their Courſe and Poſition; but not only differ ſometimes from thoſe which ariſe from the *Dura Mater*, but alſo even thoſe that are derived from one Muſcle have in ſome Places a Tendency different from them, proceeding from another. Thus I have, in the *Perioſteum* of one of the Bones of the Leg, obſerved Three different Series of Fibres lying one over another. Thoſe next to the Bone were ſtreight, but the reſt ariſing from Two ſeveral Muſcles, whoſe different Poſition imparted to their Fibres in their Elongation a different Tendency; for thoſe that were propagated from one Muſcle proceeded obliquely one Way, and they that were derived from the other obliquely the other Way; ſo that they decuſſated one another, juſt as the Fibres of the obliquely deſcending and aſcending Muſcles of the *Abdomen* do. And according to the Poſition of the Muſcular Fibres, the Filaments which are propagated from thoſe Muſcles are ſometimes parallel, ſometimes tranſverſe, or oblique to them which have their Origin to the *Dura Mater*; and therefore I have obſerved, that in tearing the *Perioſteum* in ſome Parts, it has been more eaſily rent directly, *viz.* where the Filaments were all parallel, and in others where ſome of them were oblique or tranſverſe, it would be very apt to be rather torn aſunder that Way.

Tho' the Tendons of many Muſcles ſend forth their Fibres to form ſome Part of the *Perioſteum*, yet I have taken Notice alſo, that ſome of them have penetrated this Membrane, and were immediately inſerted into the Bone; ſo that I could diſtinguiſh the *Perioſteum*, which lay like a Circle round them; which makes me imagine, that all thoſe Threads of the *Perioſteum* which are derived from the Muſcular or Tendinous Fibres, after they have extended themſelves ſo far as to make up their Part of this Membrane, are inſerted into the Bone, and that they are particularly theſe which penetrate into it; as will be ſhewn hereafter.

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From whence it may appear with how little Reaſon the *Pericranium* has been made a diſtinct Membrane from the *Perioſteum* of the *Cranium*; for though it be divided at the Temporal Muſcles, this is no more than what the different Series of Fibres produce in the *Perioſteum* of the Leg, or any other Part: For I have, upon the Shin-Bone of an Ox, divided it into Four or Five ſeveral Membranes, if they may be call'd ſo, after it had been well dried.

The Adheſion of the *Perioſteum* to the Bone is firm and intimate, partly by Contiguity, partly by Continuity, or by the Inſertion of ſome of the Filaments of the *Perioſteum* into it, as alſo by the Blood-Veſſels which are propagated out of one and ramefied in the other, and like ſo many ſmall Ligaments tie them together.

By a contiguous Adheſion, I underſtand that Union which ariſes from the immediate Coadjacence or Contact of Two Bodies of a fixed Nature, without the Intervention of any either volatile or elaſtick Matter; ſo as to concur with that Force which endeavours to ſeparate them, and is a Manner of Conjunction which certain Experiments, which it is needleſs to mention here, do demonſtrate to us. That Part of the *Perioſteum* which is thus adherent to the Bones, muſt be the Fibres proceeding from the *Dura Mater*, becauſe theſe lie next to it. To add to the Strength of this Union or Adheſion, this Membrane, on that Side where it is next to the Bones, is ſo formed as to receive a conſiderable Enlargement by inſicious and ſmall ſuperficial Cavities on the outſide of the Bones; and by Ridges and other Prominencies on that Side of the *Perioſteum* which is immediately apply'd to it; all Union of this Kind being ſo much the more firmer, as the Superficies is larger where the two Bodies touch one another.

But to render this Notion the more intelligible, I conceive that the Bones approach very near to the Nature of a *Gluten*. When they have made ſome Advance toward their natural Temper, they are like a melted Glue, unto which the *Perioſteum* being applied whilſt they are yet ſoft and glutinous, does adhere, tho' not ſo firmly at firſt; but as theſe glutinous Bones become to be indurated, and their Parts fix'd, the Union betwixt them and their Membrane is rendered more firm, until at laſt they are ſcarce ſeparable. And as the *Perioſteum* at firſt cleaves to the Bone whilſt it is as yet ſoft; ſo afterwards, that Matter which gives Increaſe to the Bones being when it is firſt apponed to them glutinous, like the Subſtance of a new formed Bone, is as apt to cleave to any Addition made to the *Perioſteum* in its Growth, as the Bone it ſelf was to ſtick to its Membrane at its firſt Formation. This Notion is founded not only upon Conjectures, but upon a ſmall Experiment I made alſo upon this Account.

I diſſolved a Piece of Bone in *Aqua Fortis*, and then in a glazed Veſſel, over a Fire, evaporated ſo much of the liquid Part, that the Solution was reduced near to the Conſiſtency of a Jelly. After it was cold, it not only reſumed its Hardneſs, (tho' more Brittle) but ſtuck to the Veſſel as firmly as any Glue could do to a Veſſel of the ſame Kind. Beſides, the Bones in a *Fœtus* are apparently gelatinous and viſcous at the ſame Time; and in a Calf which I had taken out of a Cow ſome Time before it was to be excluded, where the greateſt Part of the Bone was in ſome Meaſure indurated, I found ſuch a gelatinous Subſtance betwixt that Part which was more ſolid and the *Perioſteum*.

But beſides this Sort of Union, the *Perioſteum* adheres to the Bone alſo by little *Fibrilles*, continued from the ſame Membrane, and penetrating into the Subſtance of the Bones, as may be obſerved in a perfect Bone, but more eſpecially in ſome Places. I diſcovered it very plainly in the Bones of a Calf, which were tender and imperfect; where I obſerved theſe Threads penetrating that gelatinous Matter which lay under the *Perioſteum*, and beyond it were inſerted into that Part which was indurated, out of which I could draw ſome of them.

By the Means of theſe Fibres, and of the *Perioſteum*, it is probable, that the Bones have ſome internal Senſe, not only in their Membrane, but alſo in their Subſtance. The Teeth which are, at leaſt in that Part which ſtands above the Gums, more ſolid than any other Bones, will nevertheleſs be affected by Injuries which make no immediate Impreſſion upon the Nerve, which lies within

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in their Cavities: As for Inſtance, by Acids, which ſet them on Edge, and conſequently diſcover to us the Senſibility of the Bones. Now conſidering that this Senſe muſt be by the *Fibrilles* of the Nerve inſerted into them, that theſe Nerves ſupply the Defect of the *Perioſteum* in that of the Teeth that are above the Gums; and that this Membrane ſends forth its *Fibrilles* into all the Bones, how can we think, but that any irregular and tumultuous Motion in the Spirits of theſe ſolid Parts, is communicable to the Brain by the Mediation of thoſe Fibres, which are propagated from the *Perioſteum* into any Bone, as well as by the nervous Fibres, which are diſperſed in the Subſtance of the Teeth. There is an Obſervation of this Kind of *Nicolaus Maſſa*, mentioned by *Diemerbroeck*, of a certain Perſon that had an Ulcer in his Leg, the Bone whereof, which was diveſted of the *Perioſteum*, could not be touched without Pain; and that the Bone being perforated, he found it was not without Senſation in the internal Part of it; which made him ſuſpect that ſome Nerves were ramified into the Bone, but has left it to others to find them: But as, with the ſtricteſt Enquiry, I could never find any ſuch Thing; ſo I have ſhewn how the Want of Nerves is ſupplied.

The firſt Uſe of the *Perioſteum* is to be a Tegument to the Bones.

Secondly, it conveys Spirits into the Subſtance of the Bones, for the Support of their Heat, for the Preſervation of their Senſibility, and for their Accretion and Nutrition. I told you before, that this Membrane ſends its minute Fibres into the Bones. Theſe, I ſuppoſe, are continued ſo far as to be *Infundibula*, and diſcharge themſelves into the Interſtices of the bony Strings, in which the Spirits move afterwards as in their proper Channels; and therefore ſome of theſe Fibres penetrate farther into the Bones than others, as the Interſtices are either nearer or more remote from the Surface of the Bone.

Thirdly, it ſeems as if this Membrane did help to check the Growth and Limits of the Bones; ſo that when it ceaſes to be extended, then there is a Stop put to their Encreaſe alſo. For we find the *Perioſteum* to be ſtretch'd to its utmoſt Extent upon the Bone; ſo that when it is divided, the *Labia* cannot be brought to lie one over another without tearing. Neither will it ſeem improbable that ſo thin a Membrane ſhould ſtop the Encreaſe of the Bone, if we conſider its Strength, and that ſomething of the like Nature happens ſometimes in the young Trees, the Bark of which is often opened in order to make them grow and thrive. We know alſo that the Skin of a Horſe which is naturally more tenſile when he is Hide-bound, as they term it, hinders his growing. Not that I think this to be the only or principal Thing that determines the Growth of the Bone, but alledge it only as concurring with another Cauſe, which I ſhall explain when I come to ſpeak of Accretion.

Fourthly, the *Perioſteum* is ſerviceable in the Conjunction of the Bones and their *Epiphyſes*, whilſt the Subſtance of the *Epiphyſis* is as yet cartilaginous, of thoſe Bones which are joined by Sutures or Harmony, and in the Connexion of the Bones and their Cartilages. For this Membrane being very ſtrong, and not tenſile like ſome other Membranes, it does not ſuffer them eaſily to be diſplaced without a Diſruption. This is very evident where the Cartilages are joined to any Bones; for if we take the *Scapula*, or any of the Ribs, and divide this Membrane round that Part where the Cartilage is united to them, they will be eaſily ſeparated, notwithſtanding there is another Contrivance beſides this for their Conjunction.

Fifthly, it ſerves to join the Heads and Tendons of the Muſcles faſt to the Bones; for tho' the Tendons of ſome Muſcles do penetrate this Membrane directly, and are immediately inſerted into the Bone; yet the Originations as well as the Tendons of many Muſcles, have their immediate Dependance upon the *Perioſteum*, by whoſe Mediation they are faſtened to the Bone. And for this Reaſon it ſeems to be, that Nature has made the Adheſion of this Membrane to the Bone ſo firm by that Contrivance, which I have taken Notice of before.

Sixthly and laſtly, if the Senſe this Membrane has, was intended, as it ſeems to be, with a particular Reſpect to the Bones themſelves, it was deſigned for the Security of the

the Bones againſt external Injuries; for the diſcovering to us the Part affected, to direct us in the Application of proper Remedies. 'Tis certain that we all have a natural and immediate Abhorrence of Pain; and as the Apprehenſions of it, ſo the Endeavours to prevent it, are quick, and makes us withdraw them immediately from any Dangers of Miſchief. Thus Nature has furniſhed the Eye with the *Tunica adnata*, which being acutely ſenſible, and conſequently very obnoxious to Pain, gives us Occaſion of ſhutting our Eyes againſt any Thing that may hurt it.

Of the Nature and conſtituent Parts of the Bones.

THE next Thing that comes in View, and under our Examination, is the Bone it ſelf; and I ſhall enquire, firſt, into the Nature of Bones, which, like other Products of Nature, have their Beginning, their Tendency to Maturity, and their Perfection.

At their firſt Beginning they are ſoft and gelatinous; that is, whilſt their proper Parts not only are diſunited, but have a Mixture of moiſt and looſe Particles which intervene, ſuch as are neither apt themſelves to be fix'd, nor will ſuffer thoſe which are fit to make a Bone to unite: As we ſee Water, inſinuating it ſelf between the Particles of *Gum Arabick*, or any Body of that Nature, deſtroys its Hardneſs, and renders it ſoft and gelatinous. When they begin to advance towards the Temper of a Bone they are *Cartilaginous*; *viz.* as thoſe Particles that are fit to make a Bone are driven nearer to one another by the Power of the Spirits, and the Preſſure of that nutritious Juice, which they drive to, and crowd againſt them, they thruſt out, and begin to free themſelves from thoſe Parts that lay between them, and prevented their mutual Coalition and Union which was requiſite to make them a ſolid Body: But ſtill theſe Particles are not united at their Extremities, which makes the Parts they conſtitute remain as yet leſs ſolid, and more pliable than a perfect Bone. But when the Bones come to their proper and natural Perfection, they are ſolid, and conſiſt altogether of Parts which are naturally void of Motion, which being united, do all conſpire to reſiſt a Preſſure, and any Endeavours to diſunite them; ſo that they can neither be agitated by volatile Particles within, nor be diſordered but by ſome extraordinary Violence from without. Theſe Parts are of Two Sorts; *viz.* Terreſtrial and Saline.

'Tis true, if we put the Bone to the fiery Torture, it ſeems to confeſs that it contains all the Chymical Principles; for it produces a Spirit, a Phlegm, a volatile Salt, and oleaginous or ſulphureous Subſtance, (in which there is the ſame Difference to be obſerved as in the Marrow, one Part being more liquid, the other more hard.) After theſe we have the Terreſtrial, and ſome fix'd *Saline* Parts remaining behind. But theſe ſeveral Parts are found in a great Diſproportion, the Terreſtrial alone being, after a compleat Diſtillation, above Two Parts of Three, according to the beſt Computation. However I have, after a long continued Calcination of humane Bones, found them to be Five Parts of Nine; but by a longer Continuation of the Fire, they ſtill loſe of their Weight. Of the fix'd Salt there is very little, no more than that it may be ſaid they have ſome. The volatil Salt was about a Thirtieth Part; the Spirit and Phlegm not ſo plentiful as in the Hartſhorn, being about an Eighth, whereas in Hartſhorn they are above a Fourth Part. The liquid Oil a Twenty fourth, beſides a good Quantity of that oleaginous Matter which was indurated, and ſtuck to the upper Part and Sides of the Retort. But theſe can't, properly ſpeaking, be all called the Parts of a Bone: For the Spirits and Phlegm are drawn from the Blood-Veſſels, and the Interſtices of the bony Strings in which the Spirits flow whilſt the Man is alive, and the Oil, is certainly ſupplied from the Marrow, and inſinuated into the Subſtance of the Bone by Pores. But that which we call the *volatile* Salt, or at leaſt the greateſt Part of it, may rightly be ſaid to be a conſtituent Part of a Bone; and tho' it be raiſed and brought over by the Fire, yet the Particles of it are ſolid, and adapted to be one Ingredient in theſe hard and rigid Parts, in which whilſt they are lodged they are fix'd; and we find even after Diſtillation, that they will reſume

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a certain Degree of Solidity by Chryſtallization; beſides, this Salt ſhews ſomething of a fixed Nature upon the Tongue, having ſuch a Kind of ſenſible Coldneſs as the *Sal Prunellæ* has.

The Figure of the Particles of which the Bones conſiſt, when we conſider how they form certain Strings, ſeem to be oblong, and their Poſition ſtrait; ſo that one End lies toward one, and the other toward the other Extremity of a Bone. In the Sides of it, I ſay in the Sides; for where the Strings alter their Courſe, and run obliquely or tranſverſly, as in the *Cancelli* and ſmall Caverns of the Bones, and at the Extremities, where they lie over, and ſhut up the Cavities, the Poſition of theſe Particles muſt be different. This may, perhaps, ſeem to imply a Contradiction, when I ſay the bony Particles are of an oblong Figure, and yet make the Bones to conſiſt of two different Principles. But this is very conſiſtent with the Notion I propoſe of the Particles of all ſolid Bodies, *viz.* that none of them have the true and diſtinct Nature of one pure Principle, but are compoſed of two or more; and from the Proportion of theſe Principles, and the Manner of their Mixture and Union, ariſe the Figure and Nature of the Particles which they produce: So that tho' there is doubtleſs a Difference in the Figure of the Particles of every Principle, yet thoſe that are formed from the Union of two or more of them, may all be alike figurated in a Body which contains ſeveral Principles.

The Bony Particles are in every Series united at their Extremities, and by this Union form continued Threads or Strings, which Continuity gives a Rigidity to the Bones. The Courſe or Tendency of theſe Strings in the Sides of a Bone, is like the Poſition of the Particles; *viz.* from one End towards the other; and wherever the *Lamina* which they make are contiguous, they are alſo parallel and ſtrait, as far as the Figure of the Bone will admit. Their true Courſe is no where more eaſily diſcoverable in the Bones either of Men or Brutes than in the Ribs, where ſome of them may be ſeparated, and run in the Form of a String, for ſome Way together. And conſidering that the Horns of Beaſts are of the Nature of Bones, there are ſome of them which plainly diſcover to us, that the Bones conſiſt of ſeveral ſmall Strings, as particularly in the *Rhinoceros* Horns, in the Repoſitory, their Strings are actually divided, and viſible at their Baſis; and if we may compare the Structure of the Bones of the Animals of the Watery Element to that of ours, the Whale-Bone ſufficiently convinces us, that they conſiſt of ſuch Strings, and that their Courſe is from one Extremity towards the other. And in all the Bones, even which are not to us diſtinguiſhable into ſtringy Parts, their Tendency does plainly appear in their Fiſſures, which are to be often obſerved in them, when they are dried in the Sun or otherwiſe ſo as to crack.

Tho' ſome of theſe Strings run to the very Ends of the Bones, and others come very near to them, yet don't they terminate there ſo as to have diſtinct Extremities; but are, in thoſe very Parts where they may be thought to terminate, ſtill continued, and take their Courſe tranſverſly, making a Kind of Arches; for the Strings of one Side of the Bone proceed ſo as to meet and be joined to thoſe which are propagated from the oppoſite Side: So that at both the Ends, by this Continuation, they are, tho' not in Figure, yet in the Manner of a Ring. Neither are they all of a Length, but in every *Lamina* they fall one ſhorter than the other. For thoſe that compoſe the exterior *Lamina* run quite from one Extremity to the other, and are the full Length of the Bone; and in ſome few other *Laminæ*, which lie neareſt to this, they want no more than the Thickneſs of what is above them, and do every where, as well where they run tranſverſly as where they are ſtrait, keep a ſociable Courſe; but in all the other *Laminæ* or Plates they come ſhort of the Length of the Bone, and turn off from them, which cloſe up the Extremity of it, only by ſome Corrugations and *Apophyſes*, which form the ſmall Cavities they come to meet, and to be united in ſome certain Places. The Strings of the firſt interior *Lamina*, in thoſe Bones which have a large Cavity, do apparently firſt divert from the Side or Reſt of the *Laminæ* into the Interſtices: After theſe the Strings of the next Plate. And thus they run off one after another till we come to the Extremity, where thoſe

thoſe of ſome few of the exterior *Laminæ* which remain running tranſverſly, without any Irregularities or *Plicæ*, and being continued, as on the Sides, make a thinner, but a more compact Part, which covers and cloſes up the Extremities of the Bones. The bony Subſtance of which the *Cancelli* and the ſmall Cavities are formed, being a Continuation of the Strings from all Sides of the Bones, in thoſe which have large Cavities, from the firſt Appearance of theſe *Cancelli*, and the Formation of the ſmaller Cavities, where there is nothing of that reticular Texture, as the Strings of every Plate ſtrike off to make them, the Side or Wall of the Bone becomes gradually thinner towards the End; ſo that at the very Extremity of it, there is not above a Fifth or Sixth Part remaining to make up the Thickneſs of that Part. Thus I have obſerved in the Thigh-Bone of a Man the Thickneſs of the Wall, before any of the Strings turned off from it, to be Four Times more than that of the Head: So that if the Side be ſuppoſed to conſiſt of Thirty five *Laminæ*, the Head has no more than Seven, which lie contiguous to one another, and incloſe the Cavity.

If you ask how theſe Strings of the exterior *Laminæ* are continued at the Extremities of thoſe articulated Bones which are inveſted by a Cartilage ſuppoſed to be diſtinct from the Bone? I anſwer, that the Parts of theſe Cartilages are the ſame with thoſe that make the Strings in the Bones, diſpoſed in the ſame Order; ſo that the Series of the Particles of ſo many Strings as are anſwerable to the Thickneſs of the Cartilage, run thro' it, and would alſo turn into ſolid bony Strings, were they not prevented from uniting ſo firmly, and hardening by that Liquor which is continually ſupplied to the Joints.

The Bones in their ſolid Part, and where the ſmall Cavities are diſtinct, are compoſed of divers *Laminæ*, or thin Plates, lying one within or under another: So that the conſtituent Part of the Bone is formed by a due Subordination, *viz.* a proportionate Quantity of Earth and Salt duly mix'd, produce the Particles.

Theſe Particles, regularly diſpoſed and joined in their Extremities in every Series, make the Strings; theſe placed in a convenient Order and Number, and ſo united, frame the *Laminæ*, and theſe *Laminæ* make up the ſolid Part of the Bone, and where the Cavities are diſtinct; for where any Part of the Structure of the Bone is in the Nature of Network, or *Cancelli*, the Strings are not ſo diſpoſed as to make any *Læminæ*, but run into ſeveral *Faſciculi* of thoſe ſmaller Strings. Now conſidering that the Strings which compoſe the *Laminæ* have no diſtinct Extremities, every one of thoſe *Laminæ*, (except thoſe that have their Strings at any End running into *Faſciculi*) could they be divided entire, would be like a Tube imperforated at both Ends. Yet I did, in Two Oxes Bones which were freſh, meet with a ſmall *Lamel*, which lay next to the *Perioſteum*, that was not near ſo long as the Bone; nor did it lie round the Cavity ſo as to be tubular: But this I look upon as ſomething extraordinary.

There is alſo ſome Difference in the Diſpoſition of the *Lamels* in ſeveral Bones; for where there is a large Cavity, they are on every Side contiguous, and cloſely united, and the ſmaller Cavities and *Cancelli*, which are at the Extremities, are produced from the *Laminæ* and Strings derived from the Sides. But the Bones that are without any great Cavity, but altogether ſpongeous within, have many of their *Laminæ* placed at ſome Diſtance from one another in all their Length, except in thoſe Ways where the Flexure of their Strings this Way or that, and their *Apophyſes*, bring them to meet; and being thus modify'd all along, juſt as they are at the Ends only of the Bones that have a large Cavity, they produce in the whole internal Part the ſame Sort of ſmall oſſeous Cells.

And becauſe many of the interior *Laminæ* are diſtant from one another, they fill up the whole Space within the ſolid Part with a cavernous Subſtance, and conſequently the Sides of theſe Bones are thinner, and the *Laminæ* which are contiguous, and make their ſolid Part, are fewer than in thoſe that have a large Cavity.

On the Inſide of the *Os Humeri* of a Man, I have ſometime obſerved the firſt *Lamina*, from one End of the Cavity to the other, puff'd up in ſeveral Places, ſo as to make conſpicuous Cavities under it; but round every one of theſe Cavities it was depreſſed, and

remained conjoined to the next *Lamina*. And when it was thus elevated, I found a great many Pores, by which, I ſuppoſe, the medullary Oil did paſs out of the large Cavity into thoſe that are under this *Lamina*, and were ſome of thoſe tranſverſe Pores by which the Marrow is diffuſed betwixt the *Laminæ*.

Of theſe *Laminæ* I have, by the Help of a Microſcope, numbred Sixteen together in one Bone, without removing thoſe which I could not ſo well diſtinguiſh by the Thickneſs of them; which, if added to the former, would have encreaſed the whole Number of them to Three or Four and thirty. In another Ox's Bone I numbered One and forty together; the reſt being not ſo ſtrait and regular on that Side of the Cavity, I could not ſo exactly number, but yet computed them to be Fourteen; ſo that they were in all Five and Fifty.

The Exfoliation of the Bones furniſhes us with a preſumptive Evidence of their Compoſition of theſe *Laminæ* placed upon one another; and conſidering how near the Horns of Beaſts approach to the Nature of Bones, and how many of them may actually be divided into ſeveral thin *Lamels*, this makes it very probable, that the Structure of the Bones is framed after the ſame Manner. Beſides which, they may not only be diſtinguiſhed with a Microſcope; but I have alſo actually ſeparated theſe *Lamels* in ſeveral Bones, and particularly I have taken ſome of the thin *Laminæ* off from a Piece of a humane Skull; and in one Bone I had, I could divide the whole Wall, from the Cavity to the external Surface, into *Laminæ*, (tho' ſome thicker than others) and when I viewed any of theſe *Laminæ* with a Glaſs, and counted Sixteen or more together, whilſt they were yet united, I could not diſcern any ſuch Difference in their Thickneſs: Which makes me conclude, that thoſe I found after Separation to be thicker than others did conſiſt of thinner and finer *Laminæ*, which I could not divide.

Fig. I. Tab. I. *repreſents the Compoſition of the Bones of ſeveral* Laminæ *one within the other; as alſo the ſmall Cells and Lattiſe-work.*

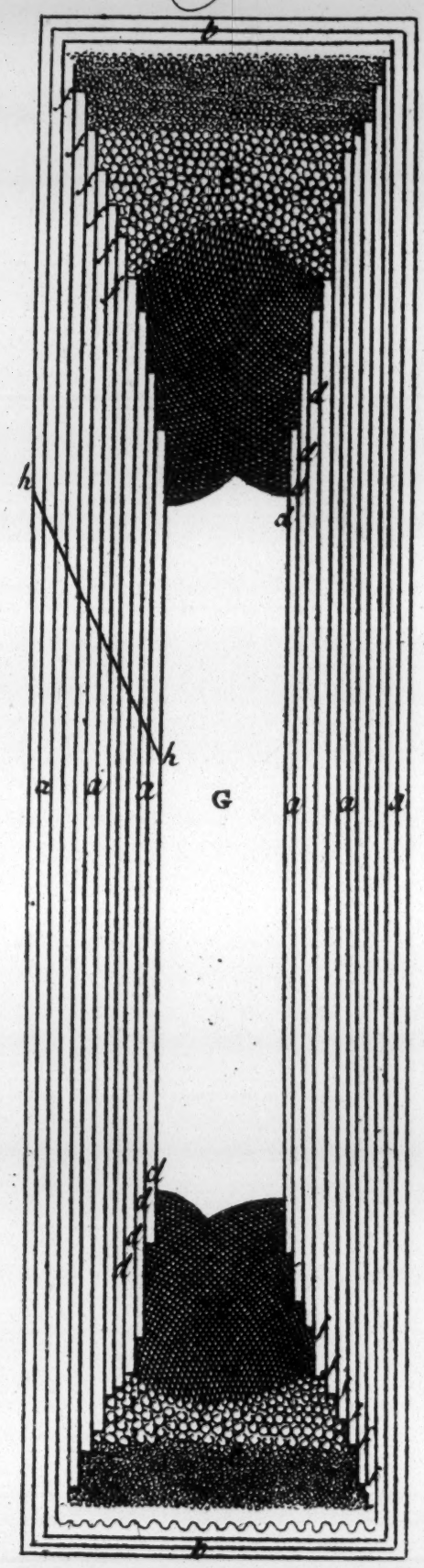
a, a, a, are the *Laminæ* in the Sides of the Bones, which muſt be ſuppoſed contiguous, though they are repreſented diſtant here.
b, b, are the Extremities of the Four exterior *Laminæ*, which are parallel and contiguous at their Extremities; as alſo in the Sides *a, a, a.*
c, c, is the Lattiſe-work produced from the Strings propagated from the *Laminæ d, d, d, d.*
e, e, are the Caverns formed of the *Laminæ f, f, f, f, f, f,* which run off from the Wall ſucceſſively, where the Thickneſs of the ſolid Part appears gradually diminiſh'd.
G, is the large Cavity.
h, h, the Paſſage of the Medullary Vein and Artery.

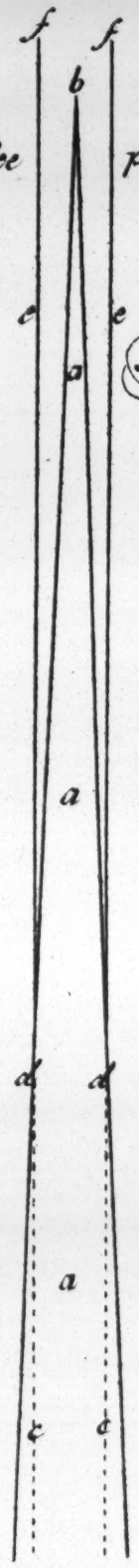
Between and through the *Laminæ* of the Bones are formed Two Sorts of Pores; (beſides thoſe deſigned for the Paſſage of the Blood Veſſels) ſome penetrate the *Laminæ*, and are tranſverſe, looking from the Cavity to the exterior Surface of the Bone; the Second being longitudinal and ſtrait, tending from one Extremity of the Bone towards the other, are formed between the *Laminæ*, and have the ſame Courſe with the bony Strings. I have the Pieces of two Bones, in one of which the tranſverſe, in the other the longitudinal Pores are very viſible with the Help of a common Magnifying-Glaſs.

The tranſverſe Pores or Paſſages are not only in the firſt interior *Lamina*, but in every one, even to that which lies over all the reſt; for I have not only obſerved them in thoſe Parts of a *Lamina* which in the Cavity have been naturally raiſed from the Side of the Bone, and in the next *Lamina* to that, but alſo in that Bone which I ſeparated into *Laminæ*, I obſerved ſome of them in all theſe *Lamels*. However I obſerved, the nearer they were to the Cavity, the more they were in Number; and that in the firſt internal *Lamina* theſe Pores were very numerous. This Difference in the Number of the tranſverſe Pores may probably be for Two Reaſons: Firſt, becauſe the Quantity of the Marrow diminiſhes as it is carried thro[illegible]

Tab: I.

Fig: I.



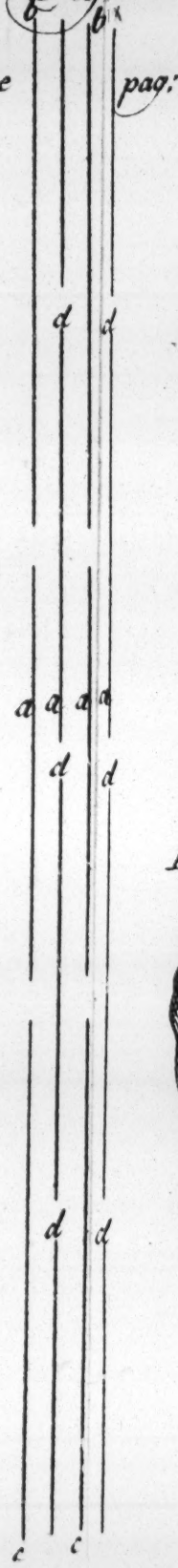


See pag. 714.

Fig: II.

Fig: III

Fig: IV



See pag.

Tab: II.

Fig: IV

b

pag: 741

d d

a a a

d d

d d

c

Fig: I.

See pag: 733.

Fig: II.

A

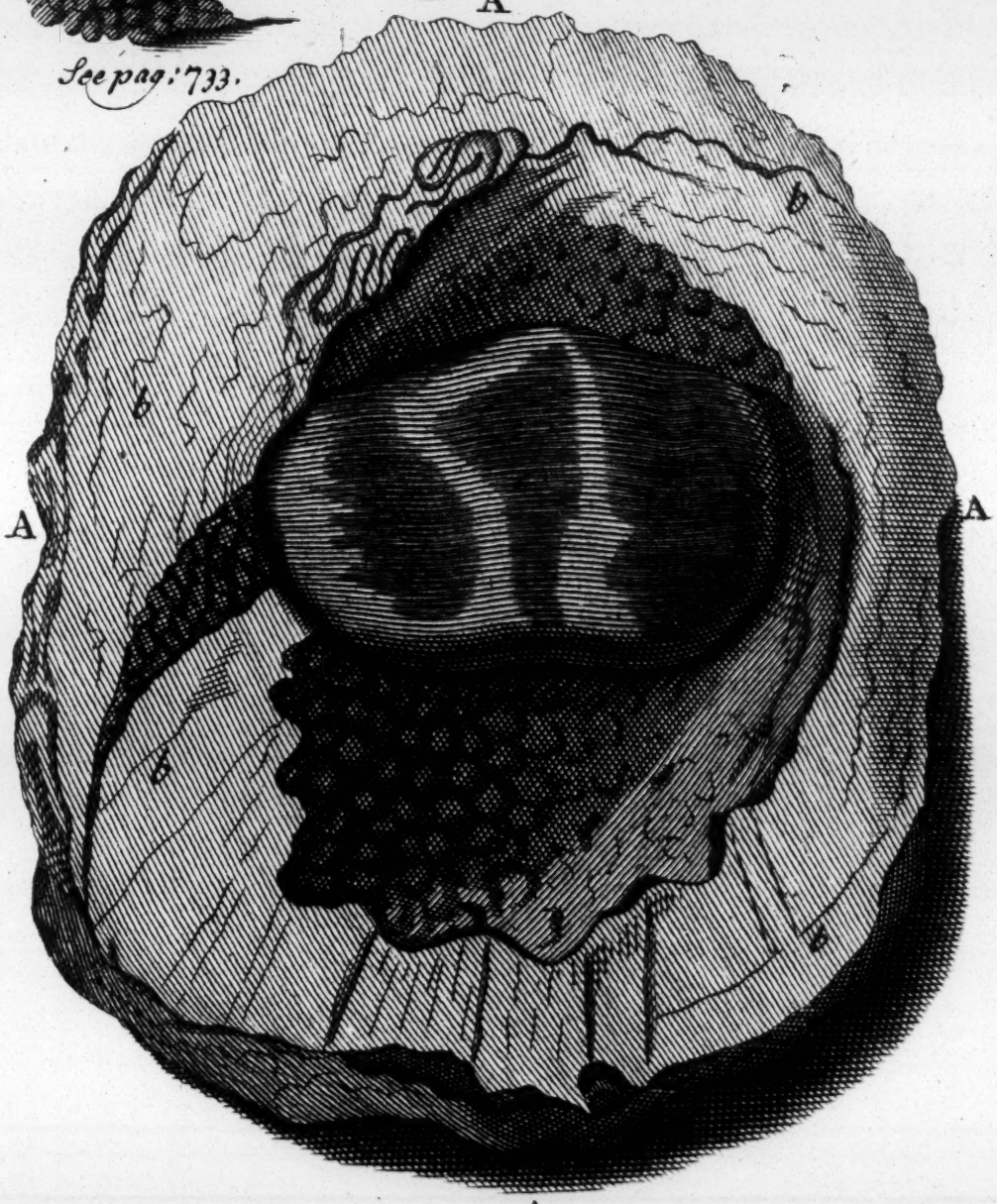


Fig: III

theſe Pores nearer to the Outſide of the Bone, every one of the *Laminæ* being gradually in its Paſſage ſupplied with as much as is neceſſary for its own Uſe. Secondly, becauſe it was requiſite that the Bone ſhould be very ſolid towards its external Superficies, where it is expoſed to external Violences. I have been particularly ſtrict in my Enquiry, whether theſe Paſſages were formed for the Blood-Veſſels, and found, that theſe Pores, for the Generality of them, had no Veſſels which paſſed into them.

Theſe tranſverſe Pores don't lie directly one under another, ſo as to form one uninterrupted Paſſage from the Cavity to the exterior *Laminæ*, which would have proved injurious to the Solidity of the Part, and not fully anſwered the End for which they were deſigned: For if they had been continued thro' the whole Thickneſs of the Bone, and that in the ſame Number, a ſmall Part only of the Subſtance of the Bone could have received the Benefit of the oleaginous Matter that is conveyed by them thro' the Bone; and if they had been ſo numerous as to ſupply all the Subſtance of the Bone, with this unctuous Matter, this would have occaſioned ſuch a Poroſity as would have deſtroyed that Solidity in the Bone which is neceſſary in theſe Parts, that are the Supporters of all the reſt; it being obvious, that theſe tranſverſe Pores which interrupt the Continuity of the Strings, would have much more impaired the Strength and Rigidity of the Bones, than thoſe that are formed in the Length of the String betwixt the *Laminæ*.

For the ſame End, as the tranſverſe Pores in the ſeveral *Laminæ* are placed, ſo as not to receive the Medullary Oil immediately from one another; ſo thoſe in the ſame *Laminæ* are not digeſted ſo as to form Circles, but irregularly, that the *Laminæ* might not be weakened, and more apt to break in one Place than another.

For the more convenient Conveyance of the *Medullary* Oil into the ſeveral *Laminæ*, there are beſides the tranſverſe Paſſages longitudinal Pores formed between the *Laminæ*, which in the Sides of the Bone have a Tendency from one End towards the other, and which change their Poſitions as the Strings do at the Extremities; where theſe are tranſverſe to the Cavity, they are ſcarce diſcoverable without the Help of very good Glaſſes, unleſs it be now and then in ſome particular Bones, and more particularly in the Ribs: Tho' I have, in the moſt ſolid Part of the *Scapula*, where the *Laminæ* were immediately united, plainly diſcerned them; and even the Marrow which had inſinuated it ſelf into them, ſticking to their Sides in Form of an Oil. I have alſo obſerved them in a humane Bone, and that between Eleven or Twelve ſeveral *Laminæ*.

'Tis by theſe longitudinal Pores that the Medullary Oil is immediately conveyed to all the *Laminæ*, the tranſverſe being ſubordinate to them, and deſigned for the Paſſage of this oily Subſtance into them. For this Medullary Oil being liquid, whilſt the Animal is alive, paſſes out of the Cavity thro' the tranſverſe Pores of the firſt interior *Laminæ*, and there being no Pores in the next *Lamina* directly anſwering to thoſe of the firſt, to tranſmit it towards the Outſide of the Bone, it naturally flows into the longitudinal Pores betwixt the firſt and Second *Laminæ*, and is carried along in them, till meeting with ſome tranſverſe Pores in the Second *Laminæ*, it paſſes thro' theſe, which when it has done, it is obliged to flow again into the longitudinal Pores, between the Second and Third *Laminæ*, and thus thro' and betwixt the *Laminæ* ſucceſſively, till it thus has opened its Way thro' the ſolid Part to the exterior *Lamina*. This is the Manner by which the Medullary Oil is conveyed in all the Bones to thoſe *Laminæ* which are contiguous, without any intermediate Cavities, to lodge any medullary Glands of their own: But where any Part of the *Laminæ* are at ſome Diſtance, and united only by Intervals, as their Corrugations bring them to meet in certain Places, there we meet with the ſmall Cells which contain ſome Medullary Glands, by which Means the *Laminæ* receive more immediately, and without the beforeſaid Way of Conveyance, the Benefit of this Medullary Oil.

Of the Superficies *of the Bones, their Paſſages formed from the Medullary Veſſels, and their Cavities.*

NExt to the conſtituent Parts of the Bones, we muſt examine their Structure, ariſing from the Structure of their Parts and the Diſpoſition of the *Laminæ*. The firſt Thing that offers it ſelf here to our View and Conſideration, is the *Superficies* of the Bone, which in all of them, except at the Extremities of thoſe which are articulated, (which of Neceſſity muſt be ſmooth to facilitate their Motion) is remarkably unequal (more or leſs) from Cavities: Some whereof are ſuperficial, others are Paſſages which penetrate deeper into their Subſtance. The moſt conſpicuous among theſe are thoſe thro' which the Blood-Veſſels of the Marrow and the Arteries do enter.

Neither are the ſuperficial Cavities only accidental, theſe Inequalities, as I have obſerved before, when I ſpoke of the *Perioſteum*, being deſigned to enlarge the Surface of the Bones, and to ſtrengthen the Adheſion of that Membrane to them. Theſe Inequalities are of two Sorts; ſome being long, and may therefore be called *Sulci* or *Furrows*; others not ſo long, and of a different Figure, which may be called *Pits* or Depreſſions.

Of the *Furrows*, ſome are larger and broader, ſome longer, and ſome more ſuperficial than others; but they all follow the Poſition of the Particles, and the Courſe of the Strings, in the *Laminæ* where they are formed; tho' in the *Os Hyoides* I have obſerved ſome few of them of a different Figure, ſome being like an *S*, others plainly oblique to the Courſe of the Strings.

Of the ſuperficial *Pits*, ſome are broader and larger, but the greater Number of them are ſmaller, and many of theſe laſt round; whereas the larger are irregular in their Figure, as if they were compoſed of ſeveral ſmall *Pits* running into one another. I have alſo obſerved in ſome of theſe larger *Pits* others that were ſmall. I have alſo ſeen, but rarely, ſome of theſe Cavities running a little Way under the ſame *Laminæ* in which they were formed, into which the *Perioſteum*, by a Protuberance anſwering to it, did inſinuate it ſelf.

Theſe *Furrows*, as well as *Pits*, don't obſerve the ſame Proportion as to their Number in all the Bones; ſome having more *Furrows*, and ſome more *Pits*, than others. The *Os Humeri*, the *Tibia*, but eſpecially the *Os Femoris*, have a great many *Furrows*, ſome of which are deep, and three and more Inches long. Beſides which, they have alſo their ſuperficial *Pits*, and that ſome of them in the very *Furrows* themſelves, which are large. The *Ulna* and *Radius* have *Furrows* as well as *Pits*. The *Fibula* has conſiderable *Furrows* in ſome Places, and yet abounds chiefly with the ſuperficial *Pits*. The Bones of the *Metacarpus* and *Metatarſus* have alſo ſome of them: But I am apt to believe they are not conſtantly alike in all Skeletons; but thus much is certain, that many of the Bones have ſome of both Sorts, and all have the ſuperficial *Pits*.

However in the *Os Frontis*, and in the Bones of the *Sinciput*, at thoſe Angles which meet in the Coronal Suture, and all along on both Sides the *Sutura Sagittalis*, I have obſerved in ſeveral humane Skulls, not ſo much of theſe ſuperficial Cavities for inlarging their Surface, as numerous Pores penetrating into the Subſtance of the Bones; particularly in one of the Skeletons in the Repoſitory they are very numerous, exactly repreſenting the tranſverſe Pores of the internal *Laminæ* in the large Cavities of the great Bones of the Joints. In one Skull, I obſerved many of them more backwards down to the Middle of the *Os Occipitis*. The ſame I have obſerved in the *Os Frontis* of an Ape, and in a Tiger, where I ſuppposſe the Fibres of the Temporal Muſcles reach'd to the *Sagittal* Sutures. I found them only in the *Os Frontis*; but I obſerved the like in the *Oſſa Sincipitis* of one *Rhinoceros* on both Sides of the *Sagittal* Suture. The Reaſon of this Difference ſeems to me to be, becauſe where theſe Pores are to be found in the *Oſſa Sincipitis*, there are no Tendons of any Muſcles inſerted; ſo that there was no great Occaſion for ſo firm an Adheſion of the *Perioſteum* in thoſe Parts, not much more than in the *Os Frontis*, where no other Muſcles but the *Frontales* having their Origination, which only corrugate the Forehead,

and

and help to raiſe the upper Eyelids, and conſequently ſtanding in no great Need of any conſiderable Strength when they act, there was no great Occaſion for any of theſe ſuperficial Cavities here: But inſtead of theſe, provident Nature has formed Pores in thoſe juſt now mentioned Parts of the Bones, for the Preſervation of our Health, and the greater Security of our Lives. For it being requiſite that the ſuperior Region of our Bodies, where the Soul performs its chief Actions, ſhould be preſerved and kept clear from every Thing that is groſs, and might impair her Functions; ſo thoſe Pores ſeem to be framed as one Way to expell thoſe offenſive Vapours which ariſe and gather within the *Cranium*. What ſeems to confirm this Opinion is, that we obſerve frequent Sweats to ariſe in the Forehead, when they are not diſcernable in other Parts; which ſeems to intimate, that there is ſome other Way of Evacuation beſides what is made from the Maſs of the Blood by the cutaneous Glands, which are to be found in any Part of the Skin as well as there. I muſt confeſs nevertheleſs, that I have not met with them in all the Skulls I have examined; but am apt to imagine, that this Difference makes ſome Variation in the State of the Brain, and that the Want of theſe Pores occaſions Dulneſs, Headaches, *&c.* without any evident Cauſe.

According to the Practice, as well of the Antient as our more Modern Phyſitians, it ſeems to be granted, that beſides thoſe cutaneous Glands thro' which the *Serum* is commonly excerned when we ſweat, there are more immediate Pores and Interſtices, which carry not only the tenuous Vapours, but alſo the more groſs and noxious Particles to the external Part of the Head, and evacuate them out of the Cavity of the *Cranium*; for they make Applications of Plaiſters as well for clearing as ſtrengthening of the Brain; and they preſcribe Iſſues in the Neck and upon the Crown of the Head in Cephalick Diſtempers; for if theſe morbyfick Particles were not conveyed by ſome other Way than by their Return into the Blood, and their Circulation thro' the ſanguiferous Veſſels to theſe artificial Emunctories, I ſee no Reaſon why theſe Applications ſhould not be as properly made in any other Part in theſe Caſes, as in that Part where it is ordered.

Some will, perhaps, be apt to ſtumble at the Thickneſs and Solidity of the Bones which theſe Vapours muſt paſs; but if they will reflect upon what has been ſaid before, concerning thoſe two Sorts of Pores formed in the moſt ſolid Part of the Bones, they will eaſily acquieſce in this Propoſition.

Beſides their ſuperficial Cavities, the Bones have all of them ſome deeper *Pits* or *Holes*, called *Foramina*, which penetrate far into their Subſtance. Among theſe, thoſe by which the Blood-Veſſels paſs thro' the Wall of the Bone to the Marrow, deſerve our particular Attention. Theſe Holes thro' which the nutritious Arteries paſs into the Subſtance of the Bones, are in ſome Places viſible; but not ſo conſpicuous as the other, nor ſo conſtantly agreeable in all Things as to admit of a circumſtantial Deſcription: But in general, many of them are at one Extremity of the Bone, and the contrary to that where the Veins paſs out. There are alſo ſome placed in the intermediate Parts betwixt the Two Extremities, which are but ſmall. The Paſſages of the Veins, excepting them which accompany the Medullary Arteries, are very numerous and minute.

As for the Paſſages of the Medullary Arteries, and the Veins which accompany them, tho' they are but few, they are conſiderable. They don't penetrate the Sides of the Bones, eſpecially thoſe which are articulated directly into their Cavities, but with an Obliquity, like the Paſſage of the Ureter's running for ſome Way between the Coats of the Bladder before it opens into the Cavity; for I have found this Paſſage ſometimes to be an Inch and a half, when the Thickneſs of the Bone was little more than the Eighth Part of an Inch. In this Manner they are generally formed in Beaſts and Fowls, as well as Men; but more obliquely in Men, and in ſome Sorts of Beaſts than in others. There is no Membrane inveſts the Sides of theſe Paſſages, neither does the *Perioſteum* on the outſide, nor the Membrane of the Marrow within, communicate any Part as a Covering to them. They are moſt obſervable in the Bones of the Joints, the *Ileum*, the Clavicles, and the lower Jaw. The *Os Humeri* and *Os Femoris* have ſometimes two or three

three. The *Radius* and *Ulna*, the *Focile majus* and *minus*, the Bones of the *Metacarpus* and the *Metatarſus*, the *Oſſa Seſamoidea*, and almoſt all the Bones of the Fingers and Toes have commonly one. The *Ileum* has Three, two on the Inſite and one on the Outſide. But after all it muſt be confeſs'd, that Nature ſcarce ever confines her ſelf either to their Number or their Place; ſo that hardly any of them are formed alike in theſe Reſpects in any two Skeletons.

However, theſe Paſſages are more conſtant in their Tendency both in Men and Beaſts, ſo that where a Paſſage runs upwards or downwards, the ſame *Foramen*, or that which anſwers to it, does in the ſame Bones of ſuch Skeletons commonly tend the ſame Way, eſpecially in the lower Jaw, the Clavicles, the Ribs, and the large Bones of the Joints. In the *Os Humeri*, the *Tibia*, and *Fibula*, they run downwards. In the *Os Femoris*, the *Radius*, and *Ulna*, they paſs upwards; ſo that in thoſe Bones which anſwer to one another in the upper and lower Joints, we may obſerve in them a contrary Tendency; and ſo it is in all the Beaſts that I have examined: But generally in all Fowls, theſe Paſſages in all the large Bones of the Joints tend downwards.

Theſe Paſſages bring us naturally from their exterior Superficies to their internal or concave Surface, where the Cavity is large, and the interior *Lamina* lies fair to be ſeen. Here are no ſtrait *Furrows*, nor ſuperficial Pits, as on the outſide, becauſe there was no Occaſion for them; tho' on the Inſide of the *Cranium* there are ſome accidental *Furrows* formed by the Turgeſcency of the Blood-Veſſels whoſe Branches they repreſent. I have alſo, but rarely, obſerved the like on the Inſide of the large Bones of the Joints.

Neither are theſe Cavities all alike, but variouſly formed, differing both in their Figure and Capaciouſneſs; beſides, that the particular Figure and Magnitude of the Bones in which they are formed do oblige them to. They are of two Sorts; the one are large, and they are ſingle in every Bone where ſuch a Cavity is formed; the other are little bony Caverns or Cells, which being numerous, make the ſpongeous Part.

The Bones which have the large Cavities are, the *Os Humeri* and *Femoris*, the *Ulna*, *Rabius*, *Tibia*, and *Fibula*. The Bones of the *Metacarpus*, *Metatarſus*, of the Fingers and Toes, and thoſe of the *Os Hyoides*. To which we may add the lower Jaw; tho' the Cavity, compared with the Magnitude of the Bone, ſcarce deſerves to be called large; neither has it any Marrow, but only the Nerve and the Blood-Veſſels.

In the *Os Humeri*, the *Os Femoris*, the *Tibia* and *Fibula*, as likewiſe in the *Metacarpus* and *Metatarſus*, the large Cavity, where it approaches to their Extremities, often begins to be divided by oſſeous Partitions, and to be occupied by ſome of the bony Strings ſhooting from the *Laminæ* in the Sides of the Bones in the *Faſciculi*, and forming larger Strings, which don't make any incloſed Cells, but the Partitions are open, and therefore are only a Part of the great Cavity, but no diſtinct Cavities. The *Faſciculi* proceeding from one Side till they meet with others which are propagated from the oppoſite Side, are united ſo as to be ſo many continued Strings, and ſhooting forth laterally, as they proceed by a Sort of *Apophyſes*, they are joined to thoſe *Faſciculi* which are parallel, and do ſhoot out on their Sides to meet them; from whence ariſe a Texture which repreſents a Sort of *Cancelli* or Lattiſes.

Where this Lattiſe-work begins firſt to be formed, the *Faſciculi* are very ſmall and ſubtile; but grow larger as they approach nearer to the ſmall Cavities: For the Danger of a Fracture in theſe Bones being leſs near the Extremities, therefore ſome Parts of the *Laminæ* are gradually diverted from the Sides. The Interſtices between the *Faſciculi* are many of them quadrangular, tho' many of them have alſo divers other Figures.

Among theſe *Cancelli* are ſometimes broad Plates, which are produced from the ſame Strings as that Texture is formed of, when ſeveral of them run together in that Order in which they lay, before they ran off from the Side of the Bone. Theſe *Laminæ* are ſometimes found in the very middle of theſe Lattiſes at ſome Diſtance from the Wall of the Bone, and ſometimes are contiguous to it, where they recede from the Wall of the Bone in their proper Form, and afterwards are divided into ſuch *Faſciculi* of the Strings as that Texture is made of.

Sometimes, after the large Cavity is thus occupied by the oſſeous Partitions of theſe Lattiſes, it opens again into an uninterrupted Cavity, without any ſuch Intertexture, except that ſomething of it is round about the Sides, and at the End the Strings run into this Form again; but little is to be obſerved of this Lattiſe-work before the diſtinct Cells begin to be formed. But commonly when the large Cavities come once to have the *Faſciculi* directed into them, and to be divided by them into ſmall Interſtices, this Lattiſe-work is continued to the leſſer Cavities, and when it approaches near to them, the *Faſciculi* grow gradually broader, till they all meet in ſuch a Manner as to run together in the Form of irregular *Laminæ*; and being thus united, they begin to make the little diſtinct Cavities which firſt appear next the Sides of the Bone with ſome of the Lattiſes ſtill continuing in the middle. I have obſerved this Texture to be very curious in the *Tibia* of a Horſe; but in Cows there is very little of it, they requiring not ſo much Strength. In Fowls, ſome large bony Strings run from one Side of the Bone to the other ſingly, like little bony Beams, which ſeldom run into the Form of a Lattiſe.

The Deſign of theſe Lattiſes in the upper Part of the Bone, is to ſuſtain that Part of the Marrow which fills the large Cavity, which in large Bones is of a conſiderable Bulk, but is ſuſpended partly by the Ramifications of the Blood-Veſſels, and their Continuation from the larger Maſs of Marrow, into that which is lodged in the Lattiſe-work; ſo running over, and winding about the *Faſciculi*; partly by the Membrane of the Marrow, which is one continued Membrane thro' the whole large Cavity, the Lattiſe-work, and the bony Cells. Hence it is, that tho' the Quantity of the Marrow makes it ponderous, and tho' the medullary Bags and Glands are tender, and, as well as the Blood-Veſſels, very ſubject to Compreſſion, yet its upper Part being ſupported by the Strings, can't make any conſiderable Preſſure upon that Part which lies under it. And therefore I have in the Bone of an Ox, where there has been but little of this Texture, obſerved another Thing; *viz.* A Jetting out of ſome of the *Laminæ*, like Ledges lying tranſverſe, for the Marrow to reſt upon, ſometimes in the Middle, but moſtly towards the Extremities. For at the lower Extremity of the Cavity, this Texture alſo bears off the Preſſure of the upper and incumbent Part of the Marrow from that which is lodged in its Interſtices.

Two Reaſons may be alledged why the Bones of the Joints, (except thoſe of the Wriſt, the *Tarſus*, the *Oſſa Seſamoidea*, and the *Scapulæ*) and one or two more, have large Cavities. Firſt, the Largeneſs of the Cavity was a Conſequence from what was neceſſary for the Strength and Solidity of the Bones, in order to prevent their being fractured laterally by any external Violence, or diſtorted by too great a Preſſure at their Extremities.

Secondly, that theſe Bones might be capable of containing a greater Quantity of Marrow, or medullary Oil; for being frequently in Motion, they expand and require greater Quantities of that oily Subſtance than any of thoſe which are not articulated: Foraſmuch as they employ it, not only for the Preſervation of their natural Temperature, and their Security againſt that Dryneſs which would make them very fragil, and does, as we find by Experience, make them apt to crack; but alſo, with the Help and Mixture of a Mucilage, to lubricate their Extremities, to maintain them in a Condition fit for Motion. 'Tis for this Reaſon that the Bones of the *Os Hyoides* have their large Cavities, becauſe they are ſo frequently moved. There are nevertheleſs ſome Bones of the Joints that are without theſe large Cavities; as the *Scapulæ*, the *Rotulæ*, the Bones of the Wriſt, beſides ſome others. As for the *Scapula*, it has no large Cavity, becauſe it can't be ſaid to move at the Articulation. The *Rotula* is ſeated in a Joint, where there is an Unctuous Matter, ſupplied from the large Cavities of Three Bones; *viz.* the *Os Femoris*, the *Tibia* and the *Fibula*, and the Bones of the Wriſt and *Tarſus*. They are alſo placed betwixt ſuch as have conſiderable Cavities.

Againſt this, it will, perhaps, be objected, That neither the *Os Occipitis*, nor the *Atlas*, which have a ſenſible Motion, are provided with ſuch a Cavity, no more than the Ribs which are moved ſo much in Reſpiration:

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but as the Head is only now and then turned towards one Side, or moved backwards and forwards, and ſoon returns into its natural Poſition, the Expence of the medullary Oil can't amount to near ſo much as to what is ſpent in the Bones of the Joints. And as for the Ribs, it is ſufficiently known that they are joined to the *Vertebræ* by a *Synarthroſis*, which is an Articulation deſigned for an obſcure Motion: For whereas the *Tibia* is ſometimes ſo inflected as to make a Fourth Part of a Circle, and in ordinary Inceſſion about the Twelfth; and the *Cubit*, ſo as to make a Third Part. The Ribs, in ordinary Reſpiration, are not moved above the Fourth Part of an Inch in that Extremity which is remote from the *Vertebræ*. It muſt be confeſs'd nevertheleſs, that they are more conſtantly in Motion than the Bones of the Joints; and for that Reaſon, the Caverns in theſe Bones are many of them of an oblong Figure, and large for the ſimple Sort; and at that Extremity next to the *Vertebræ*, they have ſometimes a conſiderable Cavity.

Beſides theſe large Cavities, there are leſſer Caverns or Cells, and that in all the Bones, not excepting thoſe that have a large Cavity, ſome of which have them at both Ends, which, where the *Laminæ* lie near to one another, are ſmall; and as they approach nearer to a Contiguity, grow leſs and leſs, till the *Laminæ*, being plainly contiguous and united, they diſappear. There are many of the Bones which have no other Cavities, as the *Vertebræ*, the *Clavículæ*, the Ribs, the *Oſſa Innominata*, *Seſamoidea*, and ſome others. Of theſe Cavities, I have obſerved Three Sorts; ſome of them there are in humane Bodies, which have *Lattiſes*; others are ſingle diſtinct Cavities, and have none of that Lattiſe-work; and a Third Sort have likewiſe no Lattiſes, but are like Two or Three, or more, of the ſingle Sort broken into one. They generally differ in their Capacities, thoſe that have the Lattiſe-work being the largeſt, and the Second the ſmalleſt of the Three; and even thoſe which are of the ſame Sort are larger than others. They differ alſo in their Figure, the firſt and laſt being of an irregular Figure; but of the ſimple ſmall Cavities, ſome being exactly round, ſome oval, others a flat oval, ſome quadrangular, others (eſpecially in the Ribs and Clavicles) of an oblong Figure, *&c.*

Theſe ſmall Cavities are all of them provided with Pores or Paſſages of Communication, whereby the Blood-Veſſels are propagated, and the Membrane of the Marrow is continued from one to another; and by which the medullary Oil has a free Paſſage out of the large Cavity into the leſſer, and out of one of the ſmall ones into another. There is nevertheleſs a great Variety in the Quantity of the Pores appertaining to every ſuch Cavity, even the Second or ſmalleſt Sort; ſome have only Two, one for receiving, the other for tranſmitting; ſome have Three or Four, or more, with this Difference, That ſome have ſeveral into one and the ſame; others have a Paſſage into ſeveral or all the ſmall Cavities that are next to them, by ſo many ſingle Pores.

Where theſe ſmall Cavities or Cells, which make the Poroſities in the Bones, were conſiſtent with their Security, either becauſe they did not ſtand in Need of ſo much Strength, or elſe becauſe they were ſo thick and ſhort as not to be in any great Danger of being fractured; and where the Quantity of Marrow which theſe ſmall Cells are capable of receiving, could anſwer to the Exigency of the Part, as in thoſe Bones which are not articulated; in all theſe, Nature had made their interior Subſtance ſpongeous; and thus, by lodging the Marrow in the ſmall Cells formed betwixt the *Laminæ*, does intermix with all that Part of the Subſtance of the Bones that medullary Oil, which was requiſite for the keeping of them from growing too dry and brittle, by a more immediate Way than firſt to ſeparate the Marrow in one large Cavity, and then to ſupply it to the Subſtance of the Bones by Pores, as it is done to thoſe *Laminæ* whoſe Contiguity renders a Bone ſolid.

Of the Blood-Veſſels of the Bones.

THE Blood-Veſſels of the Bones are, as in all other Parts of the Body, of two Sorts; to wit, Arteries, which convey the Blood into them; and Veins, which carry it back to the Heart, after it has left behind it

it ſome Particles in thoſe Glands which it touches upon in its Circulation. Theſe may again be ſubdivided into Two Sorts, in regard to their being aſſigned to Two different Parts, *viz.* ſome to the *Marrow*, and others to the Subſtance of the Bones, for their Accretion and Nutrition.

But becauſe the Medullary Blood-Veſſels will fall more naturally under our Conſideration hereafter, when I ſhall treat of the Marrow, I will at this Time confine my ſelf chiefly to the nutritious Veſſels.

Of the nutritious Arteries there are ſeveral belonging to a Bone, every one of which (as far as ever I could obſerve) enters the Subſtance of a Bone at a diſtinct *Foramen* or Hole; only I once met with Two which enter'd by the ſame Paſſage. The moſt conſiderable of them make their Entry at one Extremity of the Bone, and the contrary to that, where great Numbers of the Veins have their *Exit*, and in the large Bones of the Joints, where they are moſt obvious to our Eyes, they apparently enter at that Extremity which is next to the Trunk of the Body, except in the *Scapula:* And as they are Arteries, they do not change the Colour of that Part of the Bone, which upon that Account is whiter than the other End, or wherever the Veins which are red and more numerous do paſs out; and from that Extremity where they enter they leave a Tendency to the other Extremity. I have obſerved ſome of them running amongſt the *Laminæ* in the moſt ſolid Part, and where the *Laminæ* have been contiguous for a conſiderable Way; and ſometimes very large, conſidering the cloſe Union of the *Laminæ*, and the Solidity of the Part through which they paſs'd: But in any Part of a Bone, whilſt it is cartilaginous, they are much eaſier ſeen and traced than after it has acquired an oſſeous Subſtance. And though in ſome Parts of the ſolid Bones there is little, and in ſome no Appearance of Blood-Veſſels, yet that they are even in the whiteſt Part of the Bone does evidently appear, if we examine any Part of one that is as yet cartilaginous: And that they are very numerous, I have found ſome Reaſon to believe, from a conſiderable *Ecchymoſis* I have met with in a perfect and ſolid Bone, in that very Part which ſeemed to have been naturally white.

To add ſomething alſo of thoſe Veins which carry the Blood back from the nutritious Arteries of a Bone, theſe are very numerous where the Arteries terminate; for as they do not paſs through the ſame Paſſage, ſo they do not run one by another in the Subſtance of a Bone, as they often do in other Parts, which might have made the Paſſages through which the nutritious Blood-Veſſels are diſſeminated too large in the ſolid Subſtance of the Bone, in lieu of which the Veins which ſucceed to the Arteries do not keep near the Arterial Channels, nor continue their Courſe within the Subſtance of the ſolid Parts, but paſs out immediately at their Superficies. Their Paſſage in the ſolid Part of a Bone is ſo ſhort, that vaſt Numbers of them, if not all, ſeem to be at their Exit out of the bony Subſtance; ſingle Veins continuing diſtinct from the Extremity of thoſe ſmall Arteries they ſerve to, that they never join in any common Channel before they come upon the Superficies of the Bone; as may be gathered from their Number, and the Minuteneſs of them.

Some Obſervations of the Teeth.

THE Teeth are compoſed of Two different Parts, of a diverſe Subſtance, the one being of the Nature of a Bone, and the other truly bony:

For the Firſt has actually the Hardneſs of Stones, and the Solidity of Flints themſelves, ſo as to reſiſt in the ſame Manner the Efforts of the Saw, and has beſides this a gliſtering Brightneſs, as the hardeſt of Stones have; though after all, it will be corroded and diſſolved in *Aquafortis*, which Flints will not; which ſhews how injurious ſtrong Acids are to the Teeth. This Part I call the *Cortex* of the Tooth, being eaſily diſtinguiſh'd from the other Part; for the ſeveral Parts or *Striæ* of which it conſiſts are different in their Poſition from the Strings in the oſſeous Part, not lying ſtreight in the Length of the Tooth, but on the Sides oblique, near to the tranſverſe Poſition in ſome Animals; and upon the upper Part of

the Teeth call'd the *Grinders*, where the bony Strings are tranſverſe, and at the Point or Extremity of the ſharp Teeth they are in a Manner erect. Some Animals have theſe *Striæ* ſtreight, but ſome a little and others more oblique than thoſe in the Teeth of Men; in which I have obſerved them to reſemble a Bow, the convex Part of whoſe Arch on the Sides lies obliquely downward, and the concave upwards, with the lower End planted and fix'd upon the Side of the internal bony Part, which ſerves them for a *Baſis* to reſt upon; ſo that, when any Thing preſſes upon the other Extremity, they are not in Danger of being protruded out of their Place, being, beſides the *Baſis* they reſt upon, ſo diſpoſed, that no Impreſſions can be made laterally, but at one End of them, and ſo as to make the beſt Advantage of their *Baſis*.

Conſidering that the Teeth were deſigned for breaking the ſolid Parts of our Food, 'tis apparent why that Part which is without the Gums, and the immediate Inſtrument of Maſtication, ſhould be caſed at leaſt with a ſtrong *Cortex*, that they might not be ſo ſoon worn away. 'Tis true, ſome other Bones that are of a more ſoft and tender Nature rub againſt one another in their Articulations without any ſenſible Injury; but this muſt be attributed to that oleous and mucilaginous Matter wherewith they are conſtantly ſupplied to prevent their Attrition.

When a Tooth is broke, and this ſtony Part view'd with a Microſcope, it repreſents a Saw, or rather the Inequalities and Notches of ſuch a Grater as is made to ſome Steel Tobacco-Stoppers, excepting only the Obliquity of the *Striæ*; ſo that the Parts or *Laminæ* of it are formed with ſuch Inequalities, that are join'd together in the Manner of a Suture, the Ridges of one lying within the Notches of the other.

This cortical Part ſeems not to have any Share of that medullary and oily Subſtance which is ſupplied to other Bones, and is not altogether wanting in the other Part of the Tooth, which is truly oſſeous: For I could never obſerve any oleous Matter either in a Skeleton, or when it has been drawn from one living; ſo that it ſeems it has ſomething peculiar in its own Nature, which preſerves it from being fragile without the Help of any oleaginous Matter. 'Tis alſo much to be doubted whether that *Mucus* which ſticks upon the Teeth comes from the Teeth, it appearing rather to be ſome viſcous or gummous and terreſtrial Parts ſupplied from the *Saliva*. What is aſſerted of a Tooth's growing beyond its natural Length when its Oppoſite is wanting, may alſo admit of ſome Diſpute, becauſe I have obſerved that there has been no ſuch Elongation in ſome Teeth, though the oppoſite Ones were gone; and if it were ſo, that a Tooth encreaſes in Length from the Want of that Preſſure that is made upon it, why do not the Teeth acquire an extraordinary Thickneſs in that Part of the *Cortex* where there is no ſuch Preſſure, as there is not on their lateral Parts? Wherefore this Elongation may rather be thought to be the Protruſion of a Tooth from an Extravaſation and the Preſſure of ſome nutritious Juice flowing into the Socket; juſt as we obſerve, after a Tooth is drawn, the *nutritious Juice* of the Jaw fills the *Alveolus* with an oſſeous Subſtance: Or, after all, if the Tooth does grow beyond its ordinary Length, this Addition is not in its cortical Part; for though it ſeems as if ſo thin a Subſtance, as hard as it is, could not ſerve a Man's whole Lifetime without a Reparation of thoſe Parts that are worn off, yet when the Teeth, as well as other Parts, have a certain Magnitude preſcribed to them, and the Solidity of the cortical Part fixes the Bounds of them, they encreaſe more firmly, and become more immoveable, than they appear to be in any other Part of the Body. I cannot believe that the ſtrong Caſe has any preternatural Encreaſe after the oppoſite Tooth is gone.

This ſtrong *Cortex* in Men, the Lion, and other carnivorous Animals, covers all that Part of every Tooth that ſtands without the Gums; but ſo ſoon as the Teeth come within that Fence, it grows thinner, and ſoon ends, the Teeth being not ſo much expos'd to Violence there, as in their naked Part. In the *Dentes Inciſores* and *Canini*, both in Men and Beaſts, all that Part which is within the Gums is covered with ſuch a *Cortex*, but in the Teeth call'd the *Grinders* there is a great Difference; for in Horſes, Sheep, Goats, the Antelope, the Rhinoceros, and

and ſuch Beaſts as live upon Graſs and Corn, the Baſis, or that Extremity which ſtands out of the Gums, is not covered with it, but only the Sides, and it runs to that Extremity, where it terminates in a ſharp Edge; but ſometimes there grows over it a bony Cruſt: And whereas in Men and other carnivorous Animals there is none of this ſtony *Cortex* within the bony Part, it is otherwiſe in thoſe Animals; in whoſe *Grinders* there is the ſame Sort of Subſtance within mix'd with that Part, which is bony, and that in ſeveral Places, which riſes up likewiſe with an Edge above the oſſeous Part, and is ſometimes continued to the very End of the Roots: In all which appears the peculiar Care of Providence in the Formation of theſe Parts in ſeveral Animals, in accommodating them to the Nature of their Food; for in Men, whoſe Food is for the moſt Part ſoft, they are obtuſe. In the Lion, Tyger, Dogs, and ſuch other Creatures as eat Fleſh, but often have no other Food than Bones, though theſe Teeth are covered with a ſtony *Cortex*, they are beſides this ſharp with ſeveral Points: But in thoſe Animals whoſe Food is groſs, as Hay and Corn, this ſtony *Cortex* riſes up in ſeveral Places in Ridges, with a Kind of Edge, and does anſwer to the Inequalities of a Mill-Stone. In Hogs, that feed upon Fleſh as well as upon Graſs and Corn, they have alſo a ſtrong *Cortex*, but ſuch a one as is of a middle Nature, and adapted to the Maſtication of both.

Underneath the ſtony *Cortex* in humane Teeth, and of other carnivorous Animals, and within the ſame *Cortex* in other Beaſts, and within the Gums, is placed the other Part of the Tooth, which is truly bony, being compoſed of *Laminæ* as other Bones are, which I have plainly diſtinguiſhed in a Horſe's Tooth.

From the different Conſtitution and Degrees of Solidity of theſe Two Parts of the Teeth, it is very apparent why they ſometimes decay ſo much on a ſudden, *viz.* when the exterior ſtony Part is once broken; whereas this *Cortex*, which is by much the thinner Part, is daily employed for many Years without any remarkable Detriment: And hence it is alſo, that when the Gums are eaten away, ſo that ſome Part of a Tooth which is not covered with the ſtony *Cortex* is laid bare, is ſoon eroded, whereas that Part which is defended by the *Cortex*, though without the Gums, ſuffers no Detriment.

The Teeth have all of them, in that Part which is within the Gums, a *Perioſteum*, which nevertheleſs is not the ſame Membrane that is common to the other Bones; for that which covers them within the Gums is not a Continuation of the *Perioſteum* of the Jaw-Bone, but is united to or rather derived from the Membrane which covers the Gums, and is common to the whole Mouth. It does not end with the Gums, but when it comes to their Edge turns in, and is reflected between the other Side of the Gum and the Tooth: Then it deſcends into the *Alveolus*, and adheres immediately to thoſe Parts of the Teeth that are within. With the Membrane in ſome Teeth is communicated to their Roots, eſpecially in the Upper-Jaw, ſome Part of the hard and fleſhy Subſtance of the Gums, by which the Teeth are more firmly fix'd in the *Alveoli:* Beſides, that there is the ſame Contrivance for the ſtrong Adheſion of the Membrane as in other Bones, *viz.* Inequalities or ſuperficial Cavities. In Men they have often irregular Pits, and in ſome circular and wide Furrows. The Teeth of the Rhinoceros have alſo broad and circular Furrows, and in thoſe of the Tyger the Furrows are very numerous, but ſtreight, and run from one Extremity of the Tooth towards the other.

Though the Teeth themſelves have not that common *Perioſteum*, yet the Sockets in which they ſtand are not deſtitute of it. The *Perioſteum* which covers the Jaw-Bone running to the Edges of the *Alveoli* or Sockets, turns into thoſe Cavities, being on one Side contiguous to the Bone, and on the other to the fleſhy Subſtance, which is an Addition to the faſtening of the Teeth; and where none of that hard Fleſh intervenes, it does coaleſce with the Membrane which immediately covers that Part of the Teeth which lies within the Gums, and thus they make as it were but one Membrane.

There is another Thing very remarkable in the Teeth, ſcarce to be obſerved in other

Bones, and that is their Nerves; which Difference ſeems to be chiefly, if not ſolely, for the Sake of that Part which has no Membrane to ſupply the Want of the *Perioſteum*; for ſince the Deſign and Uſe of the Teeth would not admit of a Membrane in that Part which immediately performs the Action of Maſtication, yet it was neceſſary that it ſhould have an Influx of Spirits to be aſſiſting in its Accretion and Nutrition; upon which Account every Tooth has a Nerve that ſupplies it to this Part. The Nerve which runs along in the Jaw, and from whence the Nerve of every particular Tooth is propagated, is nothing elſe than a *Faſciculus* of other leſſer Nerves, which I have found more in ſome than in others, *viz.* ſometimes Sixteen, ſometimes Twelve, and in a humane Jaw I once found no more than Seven: But all theſe ſmall Nerves are ſtill diviſible into leſs, till at laſt they reſolve into minute Filaments. The *Foramina* by which theſe Nerves paſs into the Teeth are viſible with the Help of a Magnifying-Glaſs, and many Times alſo without it; and there is always one to be ſeen in every Root: And in a Tooth which had but one ſingle Root I have diſcovered Two Paſſages, one on each Side: Neither is the *Foramen* where it is ſingle not always to be met with at the very Extremity of the Root, but very often a little on one Side.

The Second Diſcourſe of Accretion and Nutrition. Read October 30. *and* November 13. 1689.

THat Accretion is by the Appoſition of new Matter, and that Nutrition is a Reparation of thoſe Parts which are continually expended, is eaſily underſtood; but how theſe nutritious Particles are ſeparated and ſupplied, and how they are diſperſed in due Proportion, and regularly diſpoſed of, how Accretion is performed in young Animals, till they grow to the ordinary Magnitude of their own Kind, and how it comes to ceaſe afterwards, is not ſo eaſily explained.

However, to give the beſt Account of Accretion and Nutrition, according to an *Hypotheſis*, which I have thought fit to expoſe to the Cenſure of better Judges, there are Three Things to be explained in it: *Firſt*, The Manner how the nutritious Juice is ſupplied and apponed to the Parts of younger Animals, ſo as to give an Encreaſe to their Dimenſions. *Secondly*, What it is that puts a Stop to it in a convenient Time, or how it comes to paſs that in the Animal the Accretion ceaſes ſo ſoon as it is come to its due Magnitude, according to the Limits preſcribed by Nature to the Species which it is of. And *Thirdly*, What Nutrition is, taken in a ſtrict Senſe, and how it is performed. All which I intend to treat of at large, as far as it concerns all the Parts in general, and then to proceed to the Growth and Nouriſhment of the Bones in particular, from the before-mentioned *Hypotheſis*; which will alſo naturally lead us to the Conſideration of ſome morbifick Affections of theſe Parts, where their Nouriſhment is moſt particularly concerned.

To begin therefore with the Explication of the Manner how the Parts in young Animals are nouriſhed, ſo as to be extended in all their Dimenſions: *Firſt*, the nutritious Particles are ſupplied from our daily Aliment, aſſuming after Concoction, and a due Separation of the purer from the more groſs and feculent Parts, the Form of a Chyle, which by the Lacteal Veſſels paſſes into the Blood, taking in its Paſſage a Juice from the Lymphaducts, in which there ſeem to be many of the luxuriant Particles of the nutritious Juice of the Glands, from whence they ariſe, which communicating ſome nutritive Parts, improves the Nature of thoſe in the Chyle, which are deſigned for Nouriſhment. After this milky Juice is conveyed into the Blood, and comes to the Heart, thoſe Particles which are to make the nutritious Juice being as yet but imperfectly concocted, are there attenuated and adapted to the Pores which are to ſeparate them from the Maſs of the Blood; and being thus diſpoſed for a Separation, are then conveyed by the Arteries to all the Parts.

This Supply of the nutritious Juice from the Maſs of the Blood, is agreeable to the Sentiments of moſt of the Philoſophers and Phyſicians; notwithſtanding which, there are ſome that will attribute this to the Nerves; for, ſay they, the Part which is affected with a Palſie is often diminiſhed, though

though there be a Pulſe, and conſequently an Influx of the Blood. I will not ſtand now to anſwer this Objection; but after I have offered my Thoughts concerning the Manner of Nutrition, I ſhall then ſhew how, according to my *Hypotheſis*, an *Atrophy* may be the Conſequence of a Palſie, though the nutritious Juice be conveyed by the Arteries with the other ſanguineous Parts, and circulated in that Part which is paralytick.

Secondly, Though the nutritious Juice be contained in the Blood, and ſupplied from it, no Inference is to be made from thence, that the whole Maſs of the Blood, or any Portion of it indifferently, is fit to be united to, and to give an Increaſe to any Parts of the Body; but they are a peculiar Sort of Particles, that are every where diſperſed for that End, *viz.* ſuch as are adapted to form a Subſtance of the ſame Nature with the Part that they are to augment: And this Juice not only differs from other Humours, whether uſeful or excrementitious, but there is alſo a Difference in the nutritious Juice it ſelf; for where the Nature and Conſtitution of the Part are remarkably diverſe from them of another, as in the Bones and Fibres, there the nutritious Particles ſeem likewiſe to be different.

How far the Difference lies between the muſcular, the membranous, and vaſcular Parts, I leave to others to determine; but I conceive there is no Difference in the nutritious Juice of theſe Parts, but only in the Manner or Order in which the Particles of it are diſpoſed in their Appoſition: For we ſee in Iſſues, and about the Edges of them, the nutritious Juice of the Skin to produce ſometimes carneous Excreſcencies, ſuch a Fleſh as is different from the Nature and Conſtitution of that Part which it is to nouriſh: And notwithſtanding this Excreſcency is different from the Skin, yet is it from the nutritious Juice of the *Cutis*, becauſe the Solution of the Continuity is made in that Part upon which the Nouriſhment, after its Separation by the nutritious Glandules, extravaſates, and by adhering to the Edges of thoſe Openings by which it iſſues out, lays the Foundation, and by a gradual Addition, of it ſelf frames thoſe Excreſcencies. Neither can it be thought to be the Nouriſhment of the carneous Parts diſtinct from the Skin, becauſe the Wound or Opening does not reach ſo deep as to open the *Canaliculi* of the carneous Fibres, in order to give a preternatural Paſſage to their nutritious Parts: And in Men, the *Membrana Adipoſa* is intermediate betwixt the Skin and any Thing of Fleſh, excepting in the Lips, and Two or Three Places more.

But whether there be a Difference or not, it is always gelatinous, as it is requiſite it ſhould be, in order to diſpoſe it to adhere and unite to the Parts. This is obvious to our Senſes in the Ginglions, where the material Cauſe of the Tumour is rather the nutritious Juice of the nervous or tendinous Part extravaſated, than any preternatural Humour or Matter: For though I do not take the Origine of the nutritious Juice of the Body from the Nerves, yet I muſt allow them, as well as the other Parts, a Supply of it for their own Nouriſhment, which I take to be all the *Succus Nervoſus* they have. Now the Matter which is gathered in theſe Tumours being always a Sort of Jelly, this may help to inform us what the Nature of the nutritious Juice is.

Thirdly, The Particles which ſerve for Nouriſhment are ſeparated from the reſt of the Maſs of the Blood, before they can aſſume the proper Form of a nutritious Juice, or be employed in the Augmentation of the Parts; for if we ſuppoſe that they are caſt upon the Parts immediately by the Blood circulating through them, and (as *Diemerbroeck* would have it) that the nutritious Particles, as being a Part of the Maſs of the Blood, and circulating through the whole Body, are by the Force of their Motion driven againſt the Sides of the Veſſels which contain the ſanguineous Maſs, and ſtriking into the Pores, ſtick there; and as one Extremity of the Particles thus forced in fills them, ſo the other End which ſtands out forms another Series of new Pores, for the Infixation and Union of new Parts. If we grant this Suppoſition, we muſt make the Blood immediately to touch at every Part that is nouriſhed, and conſequently Nutrition muſt either belong only to the Veins and Arteries, or we muſt allow of an Extravaſation of the Blood, ſo as to touch upon every ſingle Fibre that is nouriſhed; which in Effect would be to make the

whole

whole Body a Compoſition of ſanguiferous Ducts only.

Fourthly, This Separation of the nutritious Juice is made by Glandules or glandular Pores, which may well deſerve the Name of Glandules, ſeeing they perform the ſame Function, which is Secretion. We cannot ſuppoſe theſe nutritious Glandules generally to be placed at the Extremities of the Arteries; for beſides that, according to that Suppoſition, it is ſcarce to be conceived how every Fibre and every Part of that Fibre, ſhould be ſupplied with the nutritious Particles, it is impoſſible it ſhould be ſo, where the Extremities of the Arteries are occupied by Glandules of another Nature, ſuch as are not deſigned for the Nouriſhment of thoſe Parts; as in the Kidneys, for Inſtance: It is plain, that at the Extremities of the arterial Veſſels in theſe Glands, are placed the Glandules which ſeparate the urinary *Serum*, and conſequently there is no Conveniency for the Situation of other diſtinct Glandules; and thoſe that are there being intended for the Separation of another excrementitious Humour, cannot be ſuppoſed to ſeparate and ſupply our Nouriſhment.

'Tis therefore my Opinion, That there are Glandules or peculiar Pores adapted to the Figure of the nutritious Parts, (which are to paſs through them) formed in the Sides of the Arteries, every where as they proceed, almoſt in the ſame Manner as the Glandules are ſeated in the ſmall Inteſtines, by which the Chyle is ſeparated from the *Fæces*, and penetrates through the Guts into the lacteal Veins; with this Difference nevertheleſs, that whereas the lacteal Glandules are placed along the ſmall Guts but on one Side of the Canal, thoſe that ſerve for Accretion and Nutrition are planted on every Side of the Arteries, and ſupply the nutritious Juice to all the Fibres, and other Parts which lie immediately round about or very near to them. Now ſuppoſing that none of theſe Glandules are ſeated at the Extremities of the Arteries, this makes them conſiſtent with other Glandules in the ſame Artery; whence it is eaſie to conclude, how the ſame Arteries which ſerve the Glandules that ſeparate the particular Humour of that Gland, ſerve alſo for the Supply of that Juice which nouriſhes it: Beſides that, this Situation is more convenient for the Separation and Supply of the nutritious Juice to the whole Body.

I hope I ſhall eaſily obtain the Reader's Pardon, if upon this Occaſion I ſhall enter upon a Conſideration of the Manner in which glandular Secretion is performed, ſince the Explication thereof will help us to underſtand how not only this, but all the Humour which Nature extracts from the ſanguineous Maſs are ſeparated.

There is certainly a Diverſity in all Glands that ſeparate a different Liquor, yet are there ſeveral general Things in which they all agree, ſo far as their Function is Secretion, without any Regard to the particular Liquors which they ſecern.

And here I muſt premiſe that natural Law of Motion, *viz.* that all Motion in its own Nature or proper Tendency is direct from its Center, and that it never does, but from the Occurrence of another Body, either fixed or differently moving, decline to an Obliquity; and each Body that is moved circularly does endeavour to recede from the Center of that Circle which it deſcribes. And though a ſolid Body, when put in Motion, if it meets with one that has a greater Force to ſtop it than that has to reſiſt, it is reverberated; yet there are certain Bodies which are not in their own Nature ſo apt to be reflected, as the viſcous, ſoft, and fluid; and be they ſolid or not, yet when there is a Continuation of Matter, which from the *Terminus a quo* preſſes them on with more Strength than what they have to recede with, ſo long they will not be reflected, though there lies a reſiſtent Body in the Way of their direct Motion; but if there be any lateral or oblique Paſſages, they will continue their Motion that Way which offers it ſelf faireſt for, and comes neareſt to the Line of their direct Motion.

This being premiſed, the Particulars wherein the general Agreement between all Glands conſiſts, may be reduced to Five Heads:

Firſt, All Glands are provided with their *Vaſa Adferentia*, or ſuch Veſſels as convey to them that Maſs from which the Particles, or that particular Humour which they ſeparate, is extracted. Theſe Veſſels, in thoſe

Glands which ſeparate any Humour from the Maſs of the Blood are commonly Arteries, though it cannot be ſaid that they are always ſo: For in the Liver the bileous Juice is conveyed in the Maſs of Blood to the Hepatick Glandules, by Veins, *viz.* the *Vena Portæ*, and its Branches, which belong to the *Parenchyma* (as the Ancients call'd it) of that noble *Viſcus*. However, they are generally of the Arterial Kind, and ſuch are the Veſſels which carry the Blood and the nouriſhing Part to the nutritious Glandules; only in the Part I now mentioned, as the *Vena Portæ*, performs the Function of an Artery to the Hepatick Glandules; ſo I am of Opinion, that it has alſo the ſame Sort of nutritious Glandules formed in the Sides of it, as the Arteries have.

Secondly, To theſe Veſſels, whether they be Veins or Arteries, belong ſmall Glandules or Organs of Secretion, which ſeem to be formed from the exterior Tunicle of the *Vaſa Adferentia*, expanded and modified in a peculiar Manner: For this Reaſon it is, that the *Vena Portæ* has a Coat extraordinary immediately communicated to it from the Membrane which inveſts the Liver: And hence it is alſo evident why the Veins have fewer Coats than the Arteries, becauſe where the one terminates, and the other ariſes, there is one Coat taken off for the Formation of the Glandules, which for the moſt Part are placed at the Extremities of the *Vaſa Adferentia*; yet not ſo, but that where it is more neceſſary for the accompliſhing the Ends for which the Juice is deſigned, they are placed alſo on the Sides of theſe Veſſels, as thoſe are that ſerve for Accretion and Nutrition.

They are always ſo placed, as to be expoſed to the Appulſe of the Blood, that like a Shore they may have the Waves beating upon them without Intermiſſion; and they ſtand ſo, as to favour the Motion of the Particles that are to be ſeparated by them, and their Tendency in a right Line, at leaſt more than the Veſſels which the reſiduous Maſs continues its Courſe into, as is very apparent in thoſe Glands, in which the Glandules are ſeated at the Extremity of the *Vaſa Adferentia*: For no ſooner is the Blood carried to thoſe Extremities, but it is reflected; the Veſſels through which it is afterwards to continue its Motion, run commonly directly contrary to that Courſe which it held in the Veſſels which carry it to the Glandules; ſo that when the Blood is arrived to the Extremities of the *Vaſa Adferentia*, the Motion of it after that, and its Progreſſion into the Venoſe Veſſels, which carry it back to the Heart, do not anſwer to its natural Tendency: Whereas the Glandules are conveniently placed for favouring the direct Motion of the Particles they are to ſeparate; and thereupon the Particles of the Liquor which they ſeparate, according to the Law of Motion, reſpecting its Tendency, preſs upon them, in order to proceed into them. And how this Aſſertion of the Poſition of the Glandules, in ſuch a Manner as to favour that Tendency, holds true in the nutritious Glandules, I ſhall have Occaſion to ſhew hereafter.

Thirdly, Theſe Glandules have Pores or ſmall Paſſages, by which they receive the Particles to be ſeparated by them; and in this all Glands do agree, that their Glandules have their Perforations on that Side where the Blood beats upon them directly, and this Perforation is their ſecretory Pore. Beſides which, they have another, whereby they diſcharge themſelves into Ducts, which meet in one common Receptacle: Though there are alſo ſome Glandules that ſeem to empty themſelves by their exoneratory Pore into the Maſs of the Blood.

Fourthly, At the Termination of thoſe glandular Pores by which the Particles of the Liquor produced by every Gland are ſeparated, or on that Side which lies next to the ſmall Cavity of the Glandules, there ſeem to be *Valves*, or ſuch a Formation as is equivalent to them.

For though the Poſition of the Glands is ſuch, that the Particles ſeparated by them when they are forced againſt them, and the Paſſages are clear, and obtain their natural Figure, cannot but, according to the beforementioned Law of Nature, enter into them; yet ſeeing that the particular Ducts leading from the Glandules to the Receptacles, or any large Conveyances, proceed in divers Glands, plainly contrary to the Courſe of the Arteries, running along at leaſt for ſome Way with the Veins, the Courſe of theſe

Ducts

Ducts is consequently as contrary to the natural Tendency of the Particles which they convey, as that is of the Veins themselves. Of this we have an Instance again in the Kidneys, where the *Tubuli Urinarii*, which convey the Urine to the *Pelvis* after its Separation by the *Glandulæ Renales*, take their Course, as contrary to that of the Arteries, and the Tendency of the Urinary *Serum*, whilst it is carried through the Arteries along with the other Particles of the sanguineous Mass, as the Veins do.

Therefore so soon as the Particles that are separated by the glandular Pores are once enter'd into the Glandules, they cannot proceed any farther in a direct Line, and agreeable to their Tendency, than if they were carried into the Veins; so that the Tendency of their Motion being altered by the Variation of the Course of these Ducts, some of them might rigurgitate into the Artery, if there were not such a Contrivance in the Secretory Pores, as both makes them capable of giving Admittance to the Particles they are to separate, and also prevents their Return.

I am not insensible, that the continual Succession and Impulse of new Matter, is by some look'd upon as a sufficient Provision against the Regurgitation of any of these Particles into the Blood by those glandular Pores, without the Assistance of *Valves*, or any Thing like them.

But Secretion being one of the grand Affairs of Nature, which is of vast Consequence, not only to our Health, but also to our Lives, she has wisely taken Care for carrying on that necessary Work, by imparting to that Part in which it is to be performed all the Advantages that could be in its Structure: And if we consider that in the Veins and Lymphatick Vessels, there is also a continual Influx and Succession of the Humours they convey, to propel the Particles that are moving in the Channels of those Vessels, yet we find that they are not destitute of their proper *Valves*, to prevent the Regurgitation or Reflux of the Blood and *Lympha*, and to promote their Circulation: Nay, even in the Heart, at those Passages into the *Arteria Pulmonaris* and the *Aorta*, where the Pressure of the subsequent Blood upon that which flows immediately before it, is more violent than in any other Part of the Body. Nature has nevertheless not thought this Pressure and propulsive Power and Succession a sufficient Remedy alone against the Reflux of that which is already thrown into the Vessels, but to make this Progression more infallible, has placed at the Passages out of these Ventricles those strong *Valves* call'd the *Semilunares*. And since the Glands serve for such necessary Uses, that have a less violent Appulse of the Blood, and Pressure of the Particles that are separated, they could not be destitute of this Advantage.

Fifthly and lastly, the Glands are provided also with sanguiferous Vessels, designed for carrying off and conveying back to the Heart that Part of the Blood which had not the Liberty to enter into their Glandules.

There is a double Impediment which stops the Progress of those Parts of the Blood that return by these Vessels into the Glandules, one whereof is *necessary*, the other *contingent*.

That which is *necessary*, lies against those Particles which are not in their Figure adapted to the glandular Pores, or which, by Reason of their Magnitude, can't enter into them. That which is *contingent*, hinders the Ingress of many of those Particles into the Glandules, tho' both in their Figure and Magnitude they are adapted to their Pores; and of the same Nature with those that are separated at the same Time by them. This must be attributed to the accidental Anticipation of other Particles of the same Kind which occupy the Orifices or Pores of the Glandules in that very Instant when they are ready to enter: For considering that the Blood is naturally in a rapid Motion, 'tis impossible but some Particles should slip by the Glandules, whilst others are in the Passages. And this is one Reason why the Blood, after so many Circulations, and the Secretions performed in those Circulations, still affords a Supply to all the Glands of those Particles which they separate, without a continued Succession of Chyle. The other Reason is owing to the Comminution of the Particles, whose Magnitude, before they were farther subtilized or attenuated, did render them incapable of entring into the glandular Pores.

The Veſſels that carry off the reſiduous Blood in the *Viſceræ* and other Glands, after it has allotted them their Share in the Veins; and theſe alſo perform the ſame Function to the nutritious Glandules, but not ſo immediately, becauſe they being ſeated at the Sides of the Arteries, (and not at the Extremities) the Blood does not immediately, after it has communicated ſome of the nutritious Particles to the Glandules, flow into the Veins, but continues its Courſe afterwards in the Artery: ſo that it is the Artery that immediately does convey the Blood from thoſe Glands, unleſs any of them are ſeated at the Extremities of the Arteries in ſome Parts; as it is probable there are in the Nerves, in the muſcular Parts, and in the Subſtance of the Bones, where thoſe Extremities ſeem not taken up by other Glandules. But after all, the Blood, when it has paſſed by all the nutritious Glandules in the Arteries, is received and carried off by the Veins.

From what has been ſaid concerning the general Congruity of all Glands in their Structures and Veſſels, and the Law of Motion, whereby all Bodies are directed in their natural Tendency, it will be no difficult Thing to conceive, how all the Humours of the ſeveral Glands are ſeparated.

As for that Separation which is made by the Glandules of the *Viſceræ*, and wherever they have their Poſition at the Extremities of the *Vaſa Adferentia*, we muſt conſider, that the Blood being hurried with a violent Motion to the Extremities of thoſe Veſſels which ſupply it to the Glands, all the Parts of it are there endeavouring to continue their Courſe in a right Line, which makes them of Neceſſity to preſs upon the ſecretory Organs, which being placed there in the Way of their Motion, and in ſuch a Manner as to favour their Tendency in a more ſtrait Line than the Veins, which run contrary to it, they are continually importuned by their Preſſure to receive them; and all the Particles of the Blood, if they could have the Liberty of Proceeding in their Motion in that direct Line, would rather enter into the Pores of the Glandules than be reflected into the Veins. But notwithſtanding this Appulſe and Preſſure of all Sorts of Particles in the Blood, againſt theſe Glandules, 'tis not poſſible they ſhould all of them continue their Motion into them, as long as the Glandules remain in their natural Tone, and their Pores retain their proper Figure; but only ſuch as have a Figure adapted to the ſecretory Pores, and are of ſuch a Magnitude as makes them capable of entring into them, can be admitted; and theſe are the Particles of which the Humour that is naturally ſeparated by every Particular Gland does conſiſt; whilſt others that are differently figured, and ſome of thoſe that are adapted to the glandular Pores, being hindred by more forward Particles of the ſame Kind, are hurried into the Veins.

It will perhaps be objected, that there are Particles of a different Figure ſeparated by every Gland: Thus thro' the glandular Pores in the Kidneys do paſs both aqueous and ſaline; and thro' thoſe of the Liver, beſides ſaline and aqueous Particles, ſome which are ſulphureous; and ſo in others. And ſince it muſt be granted, that the Particles of all theſe Principles are of a different Figure, How can the Adaptation of their Figure to that of the Pores, be made the Reaſon why every Gland does ſeparate ſuch and ſuch a Humour, ſince it is impoſſible that the Figure of more than one ſhould correſpond to it; and upon this Account Recourſe muſt be had to ſomething of a Ferment to precipitate it, and to give it its peculiar Name? But to this it may be anſwered, That according to our Suppoſition, the Pores of the Glandules are not agreeable in their Figure to the Particles of any one pure Principle, ſince there is no ſuch Thing to be found; but the Particles adapted for Separation thro' the Pores of any particular Glandules, are a Compoſition of two or more of thoſe Principles, and from the Manner of their Union and Proportion in a Particle, does ariſe the Form which adapts it to the Figure of the Pore which it is to enter.

But 'tis Time we ſhould come to the nutritious Glandules, theſe being the moſt proper Subject of our preſent Enquiry. According to our Suppoſition, theſe are in their Poſition different from all others that ſeparate any Humour from the ſanguineous Maſs; for whereas others are ſeated at the Extremities of the Veſſels which convey the

Blood to them, theſe are placed on the Sides of thoſe Veſſels.

I further obſerved, that there is ſomething like their Poſition in the lacteal Glands of the ſmaller Interſtices, where all the Pulp of our digeſted Food, eſpecially in the *Jejunum* and the *Ileon*, paſſes ſucceſſively from one Gland to another, and yields the ſame Sort of Juice to ſeveral Glandules in the ſame Canal; and ſo we may reaſonably conclude, that the Blood furniſhes the nutritious Juice to ſeveral glandular Pores in every ſingle Twig of an Artery.

But notwithſtanding this Difference betwixt the nutritious Glandules and almoſt all the others in their Poſition, yet is it not irregular; for if it be conſidered how ready they are at Hand in this Poſition, to receive thoſe Particles which they are to ſeparate, as alſo for the Continuation of their direct Motion, I don't ſee that if their Uſe would have admitted of it, and they had been diſpoſed in the Manner and Order of the Glandules of the *Viſcera*, they would have been placed more conveniently for the Performance of their Function of Secretion than now they are. Neither does their Poſition imply a Contradiction to what has been ſaid before, concerning the Situation of the Glandules, to favour the Tendency and the direct Motion of the Particles which they ſeparate (at leaſt more than the Veins): So far from this, that it is demonſtrable they are more advantageouſly placed, and ſo ſeated, as to give the Particles which they are to entertain Liberty to move in a more ſtrait Line than thoſe which are placed at the Extremities of the *Vaſa Adferentia* do; for the Motion into them is from ſome Part of the arterial Channel, tho' we ſuppoſe it to be a ſingle ſtrait Twig, more direct them to the Extremity of that Artery.

This will be more apparent to us, if we conſider how the Arteries, as they proceed, grow leſs and leſs; ſo that if a ſtrait Line were to be drawn from ſome Part of the arterial Channel where it is wide, to begin at a little Diſtance from one Side of it, and to run that Way which the Artery tends, it would, after it was carried a little Way, run thro' the Coats, on that Side of the Artery which it is next to; ſo that whatever moves ſtrait forward, near the Side of the Artery where it is more large, muſt needs, when it comes to that Part where the Artery is leſs, ſtrike upon and preſs againſt that Part of it. And if it meets there with a free and convenient Paſſage, it does more naturally continue its Courſe into that Pore, than paſs on further in the Artery, where it is check'd in its direct Road or Courſe, and obliged to an oblique Motion. As ſuppoſe, *Fig.* II. *Tab.* I. *a*, *a*, *a*, to be an Artery gradually contracted, as it proceeds towards *b*, and the Particles of the Blood to be moving in it from the contrary Extremity, when any of theſe Particles go on in the Artery as far as *d*, *d*, the Line of their direct Motion does not run towards *b*, but on in the Lines *e*, *e*, towards *f*, ſo that they will endeavour to proceed in thoſe Lines, and they will of Neceſſity make a Preſſure upon the Sides of the Artery at *d*, *d*.

Beſides, that the Blood does thus ſtrike againſt the Sides of the Arteries with a Force ſufficient to carry any Particles of it thro' and beyond the Coats of thoſe Veſſels, if there be a Paſſage agreeable to the Figure and Magnitude of any of them, is manifeſt in the Pulſe and the violent Eruption of Blood when an Artery is prick'd.

The Particles therefore deſigned for Nouriſhment being carried by the Motion impreſſed upon them, and by their natural Tendency with the other Parts of the Blood, againſt the Sides of the Arteries, and preſſing upon them, and finding Pores peculiarly fitted for their Paſſage, and the Continuation of their Motion in a ſtrait Line, enter into them, leaving the reſt of the ſanguineous Maſs to continue its Courſe in the Arteries, and out of that into the Veins. Having entered the nutritious Glandules, they are preſſed forward by every Syſtole of the Artery, as the Contraction or Subſidence of it renders the glandular Cavities placed on the Sides of it more narrow, and perhaps by a Power of Contraction which may be in the Glandules themſelves. They are alſo puſh'd on by Particles of the ſame Nature, which come behind them in every Diaſtole of the ſame Veſſel, till they are driven into the Interſtices of the Fibres of the bony Strings, and into every other Part where the Spirits move, where it is evident that they will be in the Way of the moving Spirits, em-

employed in the Office of Accretion of young Animals.

From the Manner in which, by the nutritious Glands, the nutritious Juice is communicated to all the Parts, as I have explained it, I might give ſome probable Account how the *Anaſarca* is produced; but having already tranſgreſſed my Bounds, I muſt reſerve that to another Opportunity.

For the better Underſtanding how the nutritious Particles, after their Separation by theſe Glandules, are thrown into the Way of the Spirits Motion, I ſhall lay down the following Propoſitions:

Firſt, the Spirits have not only a direct Motion, *a Termino ad Terminum*, but alſo a circular or rotary Motion, turning round their own Center. For we can't think otherwiſe than that they move by Way of *Rotation* in the Time of their direct Motion, ſince we find in the Projection of a Stone out of our Hands, or out of a Sling, that it turns round in its Motion forwards. 'Tis well known that Fire, and the Rays of the Sun, approach very much to the Nature of Spirits; and the *Scintillulæ* ſtruck off from a Flint, plainly move round their own Centers: And ſome other Effects of Fire, as well as the Rays of the Sun, diſcover more than one direct Motion in their Particles. For how ſhould they melt the hardeſt Metals without ſuch a violent Rotation of the fiery Particles that diſtract the Particles of the Body that is melted?

But without inſiſting any further upon the twofold Motion in fiery Particles, which is ſo agreeable to the Notion which all the Modern Philoſophers have of the Nature of Fire, we will proceed to the 2d Propoſition.

That the Spirits will endeavour to remove in their Motion whatever lies in their Way. For whenever a Body is put into Motion, it has a natural *Conatus* to perſiſt in it, and conſequently will force every Thing that lies as an Obſtacle before it, in Proportion to its Motion, endeavouring either to drive it forward, and to make it concur with its own ſtrait Tendency, when the Impreſſion is direct, or to caſt it off to one Side of that Line which it moves; which is done when the Impreſſion is more lateral, or the moving Body acts upon that which is moved by a rotary Motion.

Thirdly, the Spirits, by the Power of their rotary Motion, will carry the nutritious Particles to one Side of that Line in which they move, if there are either actually Spaces to entertain them, or any can be made by the Force and Power of that Motion which determines them thither. I ſay, the Spirits will rather carry them laterally, than give them a direct Tendency, becauſe the nutritious Juice being liquid and gelatinous, the Parts of it are not ſo fit to maintain a direct Motion, but apt to adhere, ſo that when the Spirits impinge againſt them, and the nutritious Particles adhere to the Spirits, they will certainly move by Way of Rotation with that Part which they ſtick to. Now the Interſtices of the nerveous Fibres, and of the Strings of other Parts, being filled up with Spirits, it is evident, that when the nutritious Parts are by the rotary Motion of the Spirits carried to any Side of theſe Interſtices, betwixt which and the Spirits there is no Vacuity, they will have ſome Stop; ſo that they adhere there, being not able to proceed any further in that Circle in which they are moving.

Suppoſe a Bowl running upon the Ground, and the moſt forward Part, as it is in Motion, meets with and ſtrikes upon any viſcous Matter, the Matter that adheres to it will turn with it, and ſo that and the Part it ſticks to will be both brought to the Ground at the ſame Time in their Circulation; and the Bowl running cloſe to the Ground, tho' it has nothing to confine it, and neceſſary to keep it down on the other Side, does not carry all the Matter quite round, but preſſing it againſt the Earth, leaves ſome Part of it ſticking behind, whilſt the Bowl continues its Motion. And ſuppoſing it be a Body that is not viſcous, but at the ſame Time not ſo ſolid as to be reverberated by it as a Piece of Wooll, Cloth, *&c.* we find it does not ſo much receive a direct Motion from that of the Bowl, which is ſo, as a lateral one from its Rotation; for the Bowl in turning will drive any ſuch Thing towards the Ground which is to one Side of its direct Motion; for when the Power of a rotatory Motion in one Body acts upon

another that is truly ſolid, the natural Tendency of that which receives the Impreſſion is not directly forward from that Part of the Body from which it received it, but lateral.

Fourthly, whilſt the Animal is young and tender, the Tone of the Parts is more lax, and the Fibres are more tenſible; ſo that in any intermediate Part between their Extremities, they are apt to yield to a Preſſure, and receding laterally whilſt the Parts are not yet united, they are capable of being removed, and ſet at ſome Diſtance from one another, by the Penetration of a new Matter betwixt them. Thus the bony Parts, whilſt they are yet cartilaginous, are ſo diſpoſed, as that the Particles of one Series can be moved laterally from them of another; and thoſe of the ſame Series are in a State to recede from one another at their Extremities.

Fifthly, the ſame Power of the Spirits Rotation that carries the nutritious Matter to the Sides of the Fibrils of the Strings of the Bones, or any other Part, will be crowding this Matter againſt them, oblige their Particles to recede laterally, and by driving it into the Interſtices, between the Extremities of the Particles, ſet their Extremities at a greater Diſtance from one another.

Let us now ſee how, according to theſe Propoſitions, we may give a particular and ſummary Account of the Manner how Accretion is performed.

The nutritious Particles therefore being ſeparated from the ſanguineous Maſs by their proper Glandules, and carried into the Interſtices of the Fibrous Threads, and of the Strings of the Bones, come under the Power and Influence of the Motion of the Spirits. For were there not ſuch an active Principle to give Motion to the nutritious Particles, to preſerve the Interſtices into which they flow free from Obſtructions, which a Matter of ſo viſcous and gelatinous a Nature would be apt to create, they would ſoon clog the Interſtices, and intercept the free Paſſage of the Nouriſhment which is requiſite for the Increaſe of that Part which lies beyond the Obſtruction, and requires a Supply of the nutritious Juice from that Glandule whoſe ſecreted Juice did firſt produce the Obſtruction.

There ſeems to be two Ways by which the Spirits diſpoſe of theſe Particles, as they have a twofold Motion to prevent the Interruption of their Flux, and the Alteration of their Tendency. One is performed by the Communication of a direct Motion to the Particles that are in their Way, and that to ſuch a Degree, as to make them move with an equal Velocity, which muſt of Neceſſity be done by that which in it ſelf has a direct Tendency. Or elſe it is done by working them laterally, and winding them to one Side of that Line in which they move; and this is performed by their Rotation. Whilſt the Fibrils and bony Strings are capable of receding and giving Way to the Preſſure of the nutritious Juice, the Spirits muſt neceſſarily act upon it by their Rotation, as it is gelatinous, and of an adhering Quality; ſo that they muſt carry it to the Sides of the Interſtices in which they move, and drive it upon the minute Fibres between which thoſe Interſtices are formed. But ſuppoſing the Spirits could at this Time act upon it by their direct as well as their rotary Motion, this would not divert or keep off the nutritious Juice from the Fibres which lie on one Side the Line of their direct Motion. For although a Body moving in a ſtrait Line will transfer a direct Motion alſo upon another that lies in the Way of its Tendency, nevertheleſs the Incidence of one may be ſuch as to impinge againſt the other in ſuch a Manner, as to communicate a lateral Motion to it by that which in it ſelf is direct.

But it muſt further be conſidered, that there muſt be Room to lodge this nutritious Matter in, without which the Spirits could not carry and fix it on one Side of the Line of their direct Motion. For if the nutritious Juice lay always under the Preſſure of their direct Motion, it muſt be forced along in the Interſtices in which they move, without ever being able to fix upon their Sides and unite. As for the Vacuity therefore which is neceſſary to this End, tho' there is no Space actually void before the nutritious Juice is driven upon the Fibrous Threads, and bony Strings, becauſe the ſmall Channels in which the Spirits are moving are filled up by themſelves, yet it is obtained both in the Bones and Fibres, as in all other Parts

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by that Force with which the nutritious Particles are driven upon them.

For whilſt the Animal is young, the Bones are ſoft, the Fibrous Parts are very tender, and the Particles of which they conſiſt not ſo firmly united as they are afterward. Hence it is that the nutritious Matter forced againſt them by the Rotation of the Spirits, does extrude them laterally, and taking Poſſeſſion of that Space which is made by its Preſſure, does adhere to the Sides of them, and conſequently makes an Addition to their Craſſitude. That Part of the nutritious Matter which is carried by the ſame Rotation of the Spirits to thoſe Interſtices that are between the Extremities of the Particles of which the Parts conſiſt, being driven in like a Wedge, makes them give Way inſenſibly, and ſets the Extremity of one Particle at a greater Diſtance from another, (yet ſo as to preſerve the Continuity of the Part) ſo that the Line which they lie in will be extended, and every Series of them elongated, where the nutritious Matter fixing, and becoming a Subſtance of the ſame Nature as the Part is of unto which it is united, adds to the Length of it.

Thus the Spirits, ſo long as the Bones and other Parts are capable of making Room to entertain the nutritious Parts out of the Way of their direct Motion, will force them upon the Sides of the bony and fibrous Strings, and by that Preſſure will oblige them to give Way where the nutritious Juice not only has Liberty to adhere to them, but by the Spirits continual Rotation is kept contiguous to the Parts until it is more firmly united, and as the nutritious Particles that are once fixed there are crowded nearer to one another by thoſe which are ſupplied afterwards, and forced cloſer together by the Rotation of the Spirits, the Matter contracts a Solidity, and at laſt aſſumes altogether the Nature of that which it nouriſhes.

This being the Way by which Nature performs the Separation, Diſpenſation, and Unition of the nutritious Parts to thoſe of the Body, I will finiſh that Part of this Diſcourſe which concerns Accretion; but can't forbear upon this Occaſion to obſerve, how reaſonable it is to think, that the hectical Heats which attend Conſumptions proceed from the Want of this gelatinous and viſcous nutritious Juice, to retund and check the Violence and Quickneſs of the Spirits, and conſequently to temper their Heat.

The Second Thing that falls under our Conſideration is, Which is the Reaſon of the Limits of an Animal's Growth, and what it is that puts a Stop to it when the Animal is arrived to the ordinary Magnitude of the Species.

This muſt be attributed either to a Defect of the nutritious Juice, and to the Alteration of the Nature of the Ferments which ſerve for Concoction and Chylification, and the Craſis of the Blood, at that Time when Accretion ceaſes; ſo that the one does not produce, and the other contains ſuch nutritious Particles as are qualified for the Separation by the nutritious Glandules.

Or elſe theſe Particles, though they are ſtill ſupplied, and after their Separation carried into the Interſtices of the fibrous and bony Strings, or any other Part, they are not at Liberty to fix, and are not joined to the Part which they are fit to give an Increaſe to.

The Firſt cannot be the Reaſon; for tho' the Blood may undergo ſome Alteration in Time, ſo it may loſe much of its Firſt Sweetneſs and balſamick Quality, and become ſharper with Age; and though we find it ſo altered after ſome Time, as to ſupply a Liquor which was not ſeparated before, to wit, the *Semen* in Men, and that from thence we might conclude, that an Alteration on the other Hand renders it uncapable of affording ſuch a nutritious Juice as it had yielded before; I ſay, notwithſtanding all theſe ſpecious Allegations, we cannot rationally ſuppoſe ſuch an Alteration and Defect to be that which puts a Stop to the Growth of an Animal; I mean in a State of Health: For it is evident, that there is a nutritious Juice, which is fit to give an Increaſe to the Parts after the Animal ceaſes to grow, becauſe there is not only a Reparation of the fleſhy Parts, but even of the Bones alſo, when either of them have loſt Part of their Subſtance. *Diemerbroeck* tells us of an adult Perſon who had a Piece of the *Tibia* ſawed off, whoſe Leg being afterward extended to its former Length, and

after

after it was ſet, kept quiet and ſtreight in a wooden Cradle, by a Callus, (which cannot be ſuppoſed to be any Thing elſe than the nutritious Juice of the Bones) ſhooting out from the Extremities of both theſe Pieces where the Bone was fractured, the Loſs of that Piece which had been taken off was repaired, and the broken Pieces again united. The ſame Thing is more frequently obſerved in the Trepanations of the Skull.

The true Reaſon therefore of this Limitation I take to be, becauſe the nutritive Particles, when (after their Separation by the Glandules) they are carried into the Interſtices of the fibrous Threads of the bony Strings, and the other Parts, are not ſuffered to fix and unite to the Parts which they were not wont to nouriſh; the Reaſon of which is, that the Fibres are ſo tenſe, their proper Parts ſo contiguous, and the Extremities of the bony Particles ſo firmly united, that they can no longer make Room to entertain them, where they may be out of the Way of the Spirits direct Motion; for the nutritious Parts, when forced againſt the Fibres and the Strings of the Bones by the Rotation of the Spirits, have a ſufficient Force to make them give Way whilſt they are laxe and tender, and their Particles not univerſally united, and conſequently may thruſt themſelves into and fix in the Vacuities, where they are out of the Way of the direct Motion of the Spirits; yet when theſe Strings or the Fibrils are become ſo ſtreight, and their Particles ſo firmly united, that they can no longer recede and give Way to the Preſſure of the rotatory Motion of the Spirits, or to the nutritious Particles actuated by them, ſo that now they are deprived of all Opportunities of fixing in any Vacuity or Place, by which Convenience the Spirits may have the Benefit of their rotatory Motion to carry the nutritive Particles to one Side of that Line in which they move the nutritious Juice, though it continues to be afterwards ſupplied, cannot have the Liberty to fix and unite as it did before; for ſtill the Spirits endeavour to remove them, that they may neither ſtop their Motion, nor alter their Tendency, and ſo they begin to act upon and to agitate them with their direct Motion, which, inſtead of forcing them to and fixing them upon the Fibres and Strings of the ſolid Parts, will carry them along in the Interſtices in which they move, to the Extremities of thoſe Interſtices, to the Habit of the Body, and to ſeveral Glands, by ſome of which they are excerned and continually ſpent: For tho' the Incidence of one Body moving in a ſtreight Line upon another, may be ſuch as to communicate a lateral Motion to it, yet where for want of Space the Body cannot move laterally or obliquely, it muſt of Neceſſity remain under the Preſſure of that Body that moves it, which will force it along in that Paſſage wherein they are both moving.

So the Spirits, though they have a rotatory Motion, nevertheleſs as they fill the ſmall Vacuities in the fibrous Parts and the *Tubuli*, through which they move in the Bones, (eſpecially when the Blood is beſt capable of ſupplying a Nouriſhment) they can no longer fix any Part of the nutritious Juice upon the Sides of the Interſtices in which they move, or ſuffer it to remain quietly and fix there, then the Parts will give Way, and allow ſo much Room as is capable of receiving the nutritious Matter to one Side of the Line of their direct Motion.

As for Inſtance: Suppoſing a Ball exactly fitted to the Cavity of a Tube, to be moving from one End of it towards the other, and that it likewiſe turns round its own Axis, and ſuppoſing any viſcous Matter to lie in the Way of its direct Motion, ſo that the one hits againſt the other, and the viſcous Body ſticks to the other which is in Motion, the rotatory Motion of the Ball will carry it to the Side of the Tube, but it cannot fix it there ſo as to leave it behind, and proceed without it, becauſe no Rotation can carry the Matter beyond the Extenſion, and from under the Power of the direct Preſſure of the Ball, ſo that it muſt of Neceſſity drive it on by its direct Motion to that End of the Tube towards which it tends.

This Motion of the Limitation of Accretion, may not only ſatisfy us in Relation to that Diverſity that is in the Size of Animal of a different Kind, and the Time allotted for their Growth, but alſo concerning the different Degrees of Magnitude in the

Individuals of the ſame Species: The Reaſon of it is, becauſe the Fibres are ſooner tenſe, and their proper Particles more contiguous to one another; for the Particles which conſtitute the bony Strings are ſooner united at their Extremities in ſome than in others, after which, be it earlier or later, the Spirits act upon the nutritious Particles by their direct Motion, and ſo the Growth of the Animal ceaſes of Courſe. But as for the different Magnitude of ſome Individuals, this depends on a more copious Supply of the nutritious Matter, and a greater Plenty and Activity of the Spirits. Neither do I queſtion but the Bones may contribute ſomething in their Encreaſe to the Elongation of the fibrous Threads, becauſe their Growth may inſenſibly ſtretch the Fibres which are annexed to them.

As for the Defect of Accretion in Children, or Perſons not adult, it ſeems to be from the Want of a nutritious Juice, as well as a Deficiency both in the Quantity and Vigour of the Spirits; and as this Defect is moſt commonly the Conſequence of diſtemper'd Bodies, their Appetite is languid, their Diet ſparing, and the Agitation of their Spirits too weak to attenuate the nutritious Parts. Hence it is, that the Ferments which ſerve for Concoction and Chylification either do not extract or do not form ſuch Particles as are adapted to the Pores of the nutritious Glandules.

The next Thing to be conſidered is Nutrition, which in my Opinion is rather a Supply of the fluid Parts, and of a Plenitude in all the Pipes and Veſſels of the Body, or ſuch an unintermittent Reparation of Spirits, of the nutritious Particles, and of all the Humours, in the Veſſels, Nerves, and Fibres, as keeps their Interſtices and Cavities repleniſh'd, and the Parts themſelves in a due Temperament; I ſay, it is rather this, than the Appoſition of any new Matter to the ſolid Parts; for it is undeniable, but that ſome Particles, which are united to and made a Portion of a Fibre, or any other ſolid Part, may be ſeparated, upon which there will follow a Vacuity for entertaining ſome freſh Matter; and wherever this happens, ſo long as there are Spirits, they will by their Rotation immediately drive ſome new nutritious Particles into thoſe vacant Spaces, to ſupply the Defect of thoſe that were removed.

Thus we may obſerve, when the fibrous Parts are eroded by Exulcerations, and the Interſtices in which the Spirits move, and to which the nutritious Particles are ſupplied, are opened, ſo that the Spirits can by their Rotation carry them to one Side of their direct Motion, we find ſuch a Supply of Nouriſhment as repairs the Loſs, by the Production of new Fleſh. Or in Caſe of Fractures of the Bones, where it is next to an Impoſſibility to bring the Two Pieces ſo exactly cloſe together, as to leave no preternatural Interſtices, or ſuch ſmall Vacuities as will be lateral to thoſe Interſtices in which the Spirits move, and the nutritious Juice flows, and ſuited for the entertaining that Part of the nutritious Juice which the Arteries and the nutritious Glands ſupply, and which the Rotation of the Spirits will determine to thoſe vacant Spaces, where being lodged beyond the Reach of the direct Motion of the Spirits, it fixes there, and being united to the Part, produces what we call a *Callus*.

But from hence no Inference can be made, that the Subſtance of the ſolid Parts ſhould be always in ſuch a Flux, as ordinarily to give Way for the Appoſition of new Nouriſhment, or that which appears in the ſolid Parts in an *Atrophy* is owing to the Loſs of their proper Subſtance, but muſt rather be attributed to a Subſidence of the Veſſels, the Dryneſs of the Fibres, or the Eximanition of their Interſtices, and the Emptineſs of other hollowiſh and containing Parts; all which, for Want of a due Diſtention are contracted, ſo that the Sides of the Veſſels, and the Filaments betwixt which the Interſtices are formed, which before, by a Plenitude of volatile and fluid Matter, were kept diſtended, approach nearer to one another, or fall quite together, ſo that the Part unto which thoſe Veſſels and Interſtices belong, muſt loſe ſo much of its Craſſitude, as was owing before to their Plenitude and Diſtention.

To put this Subſidence of the fleſhy Parts, and their Decay in their Latitude even to a *Maraſmus*, in a clearer Light, let us conſider with the ingenious Dr. *Tyſon*, how the whole Body is vaſcular, concerning the Truth

Truth whereof, beſides the Authority of ſo curious an Anatomiſt, we may ſoon be convinced by our own Obſervation; for if we enter upon a ſtrict Examination of the *Viſcera*, not excepting even thoſe which ſeem moſt compact and free from Pores, that which was formerly taken to be only for a *Parenchyma*, or Maſs of congealed Matter, appears to be nothing but Veſſels for the Motion and Conveyance, and Veſicles or carous Glandules for the Separation, with proper Cavities in ſome for the Reception of ſome fluid Matter, which the ſagacious *Malpighi* has ſufficiently convinced us of. And wherever the Defects of our Senſes may be ſupplied by Reaſon, we may conclude that the Structure of the Parts is vaſcular: For what is more certain than that the Arteries are continued where their Channels are not diſcoverable by our Senſes? Who doubts but that the Nerves have their *Canaliculi?* They that maintain the Motion of the Spirits, or the nervous Juice through them, do implicitely confeſs it. And if they have their ſmall Pipes whilſt they are Nerves, What Reaſon is there to imagine that their *Canaliculi* ceaſe when their Fibres are expanded in a Muſcle, ſeeing the Fibres themſelves are continued?

Suppoſing then the whole Body to be vaſcular, we need have Recourſe to nothing elſe but a Subſidence of the Veſſels to explain the immediate Cauſe of that Imminution of the fibrous Parts, which is obſerved in an *Atrophy*; for the Veins and Arteries not having their due Diſtention, the nervous and fibrous Channels wanting their full Repletion, the veſicular Parts, ſuch as the Fat is contained in, being empty and contracted, this muſt needs produce a remarkable Alteration in ſome Dimenſions of the Part which they conſtitute.

We are ſenſible that the Nature of the Humours and Spirits is ſuch, that they may eaſily be excerned by Evaporation, or ſome other Ways out of the Body; witneſs, among other Things, what is loſt by Sweats, and in Ulcers, where the *Fibrilli* are eroded, and the Pipes in which the Spirits move, and to which the nutritious Juice is furniſhed by the nutritious Glandules, are laid open, ſo that both may extravaſate. Are not we ſenſible of a great Expence of the nutritious Parts, and conſequently what a notorious Defect there is in Nutrition, in caſe theſe Exulcerations prove to be large? which often introduces an *Atrophy*, not only of that particular Part where the Ulcer is, but ſometimes alſo of the whole Body. Beſides, the Nature of the Fat and oleaginous Parts, which make a conſiderable Addition to the Extenſion of the Parts to which they are ſupplied, is ſuch, as not only to be inclined to be made fluid, but they are actually liquid, whilſt the natural Heat of the Body remains, and conſequently are eaſily ſeparable from one another, as alſo from the Parts they are contiguous to, and therefore excernible out of the Body. Unleſs there be a continual Supply to repair the Loſs of that which is evacuated, and did before fill their ſmall Bags, theſe *Veſiculæ* will contract themſelves, and ſubſide, and their Subſidence will detract ſo much from any Dimenſion, as the Matter which before diſtended them added to it.

The Subſtance of the ſolid Parts being ſuch, as not to admit of an Exhalation by any Heat of the Body, if they ſuffer an Imminution in their proper Subſtance, it muſt be by Way of Eroſion, and by the Effects of ſuch a corroſive Matter as will diſſolve them, and cut off the Particles; but the Conſequence of this would be Ulcers in all thoſe Parts which are thus miniſhed, and ſuch a Corroſive could not ſo affect the Fibres without an intolerable Pain, which in a Conſumption would be univerſal, whereas no ſuch Symptom is obſerved in this Diſtemper. Unto this may be added another Argument, which ſeems to prove beyond all Contradiction, That this Minution is not in the ſolid Parts: This is from what may eaſily be obſerved in the Bones even in the deepeſt Conſumptions, which, whilſt the other Parts are tabid, do not loſe any Thing of their Magnitude: But were there a corroſive Humour, that eats away the very Subſtance of the Fleſh in an *Atrophy*, it would prey more voraciouſly upon the Bones; for a Corroſive, as *Aqua fortis*, will ſooner perfectly diſſolve a Piece of a Bone, than the ſame Weight of the muſcular Fibres: The Reaſon of this is, that the Strings of the Bones are more rigid; ſo that though the Bones loſe alſo Part, if not all their

their nutritious Juice, and their Spirits in a Conſumption, yet they keep their former Poſture, for being uncapable of a Subſidence, they are not attended with the ſame Symptoms of an evident Imminution.

The Loſs of what is continually expended being in the ſpirituous, humerous, and fluid Parts, and Nutrition being nothing elſe but a Reparation of Loſs ſuſtained by thoſe Parts, it follows, that there is no ſuch Thing commonly as the Filling up of Breaches in the ſolid or containing Parts, but only a Supply of ſuch Matter as continues in a Flux, which keeping them diſtended, maintains the natural Circumference in every Part.

But before I conclude this Head, I muſt be mindful of my Promiſe, *viz.* to anſwer that Objection levell'd againſt the Derivation of the nutritious Juice from the Blood, to prove that they are ſupplied from the Nerves, which is taken from the Obſervation of *Atrophies* in *Palſies*. The whole Force of this Objection is founded upon that erroneous Notion of Nutrition, to wit, that the Subſtance of the ſolid Parts is in ſome Meaſure daily loſt, and that nutritious Juice is united to the Parts during a Man's whole Life, as it is in Time of Accretion: But this Objection is ſoon anſwered by our *Hypotheſis*, *viz.* That Nutrition is only a Fulneſs of the Veſſels which contain the ſeveral Humours and oleaginous Parts, and that of the Cavities of the Fibres; for ſo an *Atrophy* will be only a Subſidence of all or ſome of theſe. The Subſidence, if it were only of the Nerves and muſcular Fibres, ſhews only a Defect of ſomething to fill their Cavities, and does not prove it to be the Want particularly of a nutritious Juice, when it may be a Deficiency of Spirits only. But we may even grant the very Notion upon which the Objection is grounded to be true, *viz.* That Nutrition is (what they would ſuppoſe) a Reparation of the ſolid Parts, without the leaſt Prejudice to our Opinion, that the nutritious Parts are ſupplied from the Maſs of Blood, tho' they do not anſwer the End which they are deſigned for in a Palſie: For tho' the Maſs of Blood, in which, according to our Suppoſition, the nutritious Parts reſide, continues its Circulation in the Part that is paralytick, yet the Want of Spirits will hinder their Separation, when ever the Evil ſpreads it ſelf ſo far as to affect the Fibres of the nutritious Glandules: For without the Aid of the Spirits, the Fibres of theſe Parts cannot maintain their Tone, nor be kept tenſe, nor preſerve the natural Figure of the glandular Pores, which being altered by the Relaxation of the Fibres of the Glandules, are diſenabled to ſeparate thoſe Particles which are adapted to the natural, but altogether diſagreeable to the preſent Figure of their Pores.

By the Account I have given of Nutrition, it will be no difficult Task to explain the Reaſon of an evident Imminution of the natural Magnitude of any Part, when it is the Conſequence of a Palſie; for the Fibres being obſtructed, and the Influx of the Spirits which ought to extend them, and the Supply of the nutritious Juice being hinder'd, there will of Neceſſity follow the Loſs of ſo much of the Magnitude of any Parts as proceeded from that Meaſure of Spirits, and their proper nutritious Juice which is now defective. Beſides the Subſidence in the nervous Pipes, there is alſo a Contraction or Subſidence of the Blood-Veſſels; for the Expanſion of the Particles of the Blood, and the Turgeſcency of thoſe Veſſels in every Part, depending much upon the Motion and Vigour of the Spirits flowing into it, it cannot be imagined, that though the Blood continues its Influx into the paralytick Part, that the Blood-Veſſels will be ſo much dilated, when the Obſtruction and the Defect of the Spirits are ſo great, that they ceaſe to flow into it, and give an Activity to the Blood that circulates through them, as when it was rarified and expanded. This Difference is very obſervable in lean Bodies, from Heat and Cold, for when their Hands are very warm, the Veſſels are more turgid; but when the Cold weakens the Activity of the volatile Particles, and reſiſts the Expanſion of thoſe which are agitated by them, the Skin becomes flaccid, and there is ſome ſeeming Imminution in the Parts.

What has been ſaid of Accretion in general, might be ſufficient to explain the Increaſe of the Bones, and how the Callus is produced in a fractured Bone; but the bony

Parts leading me into the Conſideration of Accretion, I cannot but add ſomething in particular of the Manner of their Increaſe.

By the Arteries deſigned for their Nouriſhment is conveyed into them the Maſs of Blood, from which their nutritious Particles are ſeparated by Glandules placed in the Sides of the Arteries; and theſe being carried into the Interſtices of the Strings of the Bones in which their Spirits move, will by their rotatory Motion be driven to the Sides of the Strings, ſo as to make a Preſſure upon their Particles. By this Preſſure made upon the Sides of them, ſo long as the Extremities of the oſſeous Particles are not cloſely united, they force them to give Way laterally, and inſinuating themſelves in the Vacuities between their Extremities, enlarge the Diſtance between them, and thereby get out of he Way of the Spirits direct Motion, and ſo adhere and unite to the bony Particles.

Neither are the Bones deſtitute of Spirits to act their Part there, for they are conſtantly and continually ſupplied with them from the *Perioſteum*, by the Fibres of which they flow into the Interſtices of their Strings, and move in them as their Channels, as they did in thoſe of the Fibres in the Nerves, and all the fibrous Parts.

That we may the better underſtand how the Particles of the Bones are capable of receding both at their Sides and at their Extremities, we muſt conſider that the Bones of a *Fœtus* are ſo ſoft, that they will ſenſibly yield to the Preſſure of a Finger. When the Infant is born they are cartilaginous, and it is a conſiderable Time before they come to the perfect Solidity of a Bone. Now a Cartilage is nothing elſe but an imperfect Bone, in which the Extremities of the Particles are not united as yet to form continued Threads, but there are ſmall Interſtices between them. Though they are ſo diſpoſed, as to preſerve the Continuity of the whole Cartilage, and although when it advances nearer to the true Nature of a Bone, many of them are united, nevertheleſs they are not all ſo until the Bone obtains its full Solidity; ſo that whilſt the Bones are approaching to the Nature of a Cartilage, their Particles may either recede to one Side, or at their Extremities, which being impelled by the nutritious Juice, forced againſt them by the Rotation of the Spirits, they give Way, and make Room for the entertaining of the Nouriſhment out of the Way of the Spirits direct Motion. Thoſe Parts that are apponed to the Sides of the bony Strings increaſe the Thickneſs and enlarge the Circumference of the Bones, as thoſe that are driven in between their Extremities enlarge the Interſtices, and ſticking there, elongate every Series of the bony Particles, and conſequently the whole Bone.

When theſe Particles come to be united cloſely at their Extremities, that will limit the Growth of the Bone: And though there is alſo a lateral Union here, yet the Firſt is only neceſſary to prevent the farther Craſſitude as well as the Length of the Bones, ſeeing their Strings are continued in the Manner of a Ring: For unleſs the Spirits have a ſufficient Force to break this Continuity, they can neither protrude nor elongate theſe Strings after their Particles are once firmly united. And as it is beyond their Power to protrude the Parts of a String, ſo they can neither fix any Part of the nutritious Juice upon them, becauſe ſo long as it is in the Interſtices, it muſt be propelled by their direct Motion, which may probably puſh it forwards till it lights into ſome Way of Evacuation. I think alſo that the *Perioſteum*, as I affirmed before, has alſo a Share in limiting the Increaſe of the ſolid Parts when its Extenſion ceaſes.

But ſuppoſing that none of theſe bony Strings were continued in the Manner of a Ring, nor ſubject to any Oppoſition to their Recedure by the *Perioſteum*; yet the bony Parts being of a fixed Nature, contrary to that of the Spirits, and all active Particles, ſo long as the Preſſure of the nutritious Juice, occaſioned by the Rotation of the Spirits, is ſo ſtrong and violent, as to overpower the Fixity in thoſe Parts, it will force them to recede; but when they once come to an *Æquilibrium*, ſo that the Fixity in theſe ſolid Parts proves exactly anſwerable to the Force of the Motion of the Spirits, but much more if it exceeds it, the fixed Particles of the Bones will then ſtand their Ground, and no Body can ſuppoſe they

ſhould

ſhould be protruded by a Force which they are able to reſiſt.

What has been ſaid of Nutrition in general, may ſtill with more Certainty be affirmed of that of the Bones, *viz.* That ordinarily it is not a Reparation of their ſolid Part, or the Succeſſion of new Particles to others that are expended after they are aſſimilated; the Particles of theſe moſt ſolid Parts being ſo fix'd and firmly united after the Time of their Accretion, that there is not the leaſt Reaſon to imagine they ſhould be capable of ſuch a Flux, as is neceſſary to ſuch a Change and Succeſſion of Matter; ſo that their Nutrition is nothing elſe than a conſtant Supply of Blood to their proper ſanguineous Veſſels, and of the Spirits to the Interſtices of their Strings, as alſo of their nutritious Juice, which when a Bone is fractured or deprived of Part of any of its *Lamin*æ, (though after the Time of Accretion) is upon theſe Emergencies apponed in the ſame Manner as it was during the Time of Accretion, being carried by the rotatory Motion of the Spirits to thoſe Interſtices and defective Parts, where a *Callus* or bony Subſtance is required to knit the broken Pieces, or to make up what is loſt by Trepanning or Exfoliation.

From this Manner of the Accretion of the Bones, I conceive we may be able to give a rational Account concerning the Symptoms obſerved in the Bones in the Rickets, and the Nodes or *Gummata* which often attend the *Venereal* Diſeaſe.

The uſual Symptoms of the Rickets are an Incurvation, a Knottineſs and Protuberancies at the Ends of the Bones. The ingenuous Dr. *Mayo* has attempted to give us the Reaſons of the Obliquity of ſome of the Bones in this Diſeaſe, by ſuppoſing a diſproportionate Growth in the Bones, and the Muſcles that are affixed to them; ſo that the nervous and muſcular Parts, for want of a ſufficient Supply of the *nervous Juice*, (which he looks upon as neceſſary to this Accretion, have not their full Addition made to their Dimenſions, and ſo fall ſhort of their proportionable Length in Reſpect to the other Parts: But all this while he would have the Bones to be nouriſhed and encreaſe no leſs in ricketty Children, than in thoſe that are healthful. But as it does not appear, that there is any ſuch Reaſon for this Affection of the Bones, ſo that in caſe we ſhould grant this Inequality which is in the Diſtribution of the Nourriſhment in this Diſtemper, to be betwixt the Bones and the Muſcles, and not between the Parts of the ſame Bone, yet would not this explain the Reaſon of the Obliquity of the Bones, nor of their Incurvation.

The ingenuous Author ſuppoſes, That the Muſcles, for Want of a nervous Juice neceſſary to their Nutrition, are not extended at their full Length, but the Bones from whence they have their Originations, and into which their Tendons are inſerted, enlarge their Dimenſions; but the Origination and Inſertion of the Muſcles hindring thoſe bony Parts that lie within theſe Bounds from extending themſelves in a right Line, that Addition, as far as it makes them exceed the Length of their Muſcles, will incline them to a Bow. This *Phænomenon* might perhaps be ſolved thus, were the Origination of a Muſcle from and the Inſertion of it into the ſame Bone: But it being apparent, that as the Muſcles are deſigned for Motion, ſo betwixt their Origination and the Inſertion of their Tendon, Nature has framed an Articulation to make the Part moveable; ſo that, according to this Notion, the Brevity of the Muſcles would bend the Joint, but not produce an Incurvation in the Two Bones, or in any one of them: For we ſee, that the Muſcles, when they move any Part, are ſo ſhorten'd, as to put a Streſs upon the Bones, and to bring that Part of it into which they have their Inſertion towards their Origination, without producing any ſuch Effect as an Obliquity in the Bones, occaſioned by ſuch an Abbreviation, but only a Flexure in the Joint. The Example this Gentleman alledges of a young and thrifty Tree, that has, whilſt it is growing, a Cord faſten'd to its ſuperior and lower End, ſo that the String is extended at its full Length, is not parallel: For though 'tis beyond all Diſpute, that whatever is added in the Growth of the Tree to its Length, muſt give the Tree the Figure of a Bow, ſince it is not capable of an Elongation in a direct Line; but on the other Hand it muſt be conſidered, that this is one continued Body, without any intermediate

Articulation, which if we ſuppoſed it to have its Flexure, would be only at the Joint, and all the other Parts would preſerve their Rectitude and natural Figure.

Dr. *Gliſſon*, in my Judgment, is much more rational in his *Hypotheſis*, *viz.* That the Inequality and Diſproportion of Nouriſhment lies between the ſeveral Parts of the Bone which is affected with the Rickets, ſo that the nutritious Particles are abundantly ſupplied on one Side, whilſt they are defective on the oppoſite Side of the Bone; the Conſequence whereof muſt needs be an Incurvation in the Nature of a Bow; ſo that the convex Part will be on that Side which is ſufficiently nouriſhed, and the concave where the nutritious Juice is not apponed in due Proportion. That this will be the Effect of an unequal Nouriſhment in the Bone, he proves by the following Inſtance: 'Let there be a Pillar (*ſays he*) 'raiſed with Three Stones, lying one upon 'another: Let us ſuppoſe it to be ſuch as 'is perpendicularly ſtreight on every Side, 'and of the ſame Height: If therefore we 'put in a Wedge on the Right Side, between 'the uppermoſt and the middle Stones, the 'higheſt Stone will be inclined towards the 'Left Hand, and the Pillar will be raiſed 'higher on that Side where the Wedge is 'driven in, than it is on the oppoſite Part: 'Likewiſe if we drive in a Wedge between 'the middle Stone and that which is the 'Baſis on the ſame Side, the Pillar will yet 'be more inclined, and ſtand bending to-'wards the Left Hand; and the more Stones 'it conſiſts of, if a Wedge be driven be-'tween every Two of them on the ſame 'Side, ſo much the greater will the Obli-'quity be in the Whole; ſo that the Stones 'will no longer make an erect Pillar, but 'repreſent Part of an Arch.

'Tis true, every Stone that is thus raiſed, will with that Stick it immediately reſts upon make an Angle on that Side towards which it inclines; whereas there are no ſuch Angles in the incurvated Bones: But for this he gives us this Reaſon, *viz.* That the Nutrition, which on one Side is moſt conſiderable, is there in a Manner performed in all the Length of that Bone, and from this equal Nutrition on that Side, the Incurvation of the Bone will make Part of a Circle without Angles.

But let us ſee whether we may not explain this Notion to a better Advantage, by that Account I have given of the Manner of Accretion in the Bones. I then told you, that much of the Difference between a Bone and a Cartilage conſiſted in this, That in the *Bone* the Particles are at their Extremities, which lie oppoſite to one another in every Series, united in the whole Length of it, ſo as to form continued Strings; whereas in the *Cartilage* the Particles have minute Interſtices between their Extremities. Whilſt therefore the Bones are as yet approaching to the natural Conſtitution of a Cartilage, as they do in Infants, the Extremities of their Particles are capable of being removed, and ſet at a greater Diſtance from one another, and conſequently will entertain and admit betwixt them the nutritious Particles like ſo many Wedges driven in betwixt the Stones of a Pillar; ſo that where the Supply of the nutritious Juice is moſt abounding, and the Quantity of the Spirits which drives theſe nutritious Particles into them, is greateſt, and their Preſſure ſtrongeſt, there the Particles of the Bone will be obliged to recede fartheſt, and conſequently every Series on that Side will be elongated, whilſt on the other, if there be any Defect of the nutritious Juice, and of the Vigour of the Spirits, the Extremities of the bony Particles will not recede to the ſame Degree, nor the Accretion of that Part will proceed with an equal Pace, whereby one Side muſt needs come to be ſhorter than the other, and that Part which is moſt extended in Length, will incline the Bone towards the contrary Side, and ſo reduce it to the Figure of a Bow.

This Account, 'tis true, fairly explains the Reaſon of the Incurvation of the Bones in the Rickets: But after all, I do not think that the diſproportionate Quantity of the nutritious Particles, and the unequal Influence of the Spirits, are the true Cauſes why one Part of a Bone is nouriſhed more than another. This muſt rather be looked for in the different Conſtitution of ſeveral Parts of a Bone; for in one it lays aſide the Temperature of a Cartilage more and ſooner than it does in another; and if the Parti-

cles

cles happen to be united, and to form continued Strings, that they are not ſo capable to make Room for the Lodging of the nutritious Particles out of the Way of the direct Motion of the Spirits, ſooner on one Side than on the other, *i. e.* the Part is on one Side ſooner tending toward the Nature and Solidity of a Bone; ſo that the Spirits and nutritious Juice, though their Quantity and Preſſure be equal on every Side, cannot force the Particles equally to give Way, then will the Accretion of the Bone ceaſe on one Side, or at leaſt proceed very ſlowly, whilſt it is performed more effectually and evidently on the other; as has been demonſtrated before in the Account why Accretion ceaſes in grown Animals.

I am free to confeſs, That I never had an Opportunity of examining the Bones of any rickety Children; but am ſtrongly perſwaded, That if an Enquiry be made into them that are incurvated, the concave Part of them will be found more ſolid, and like the perfect Bone of an adult Perſon; and on the other Hand, the convex Part more agreeable to the Age of the Child to whom it did belong. For a farther Proof of this Aſſertion, let us conſider the Nature of thoſe Oils which are applied externally to the affected Part in this Diſtemper: Theſe are emollient and relaxing, ſuch as are qualified to looſen the Extremities of the Particles, and to diſſolve that Continuity of them which makes the Strings more firm and rigid, or at leaſt to ſoften it ſo, that the Force of the Spirits, and the Preſſure of the nutritious Juice actuated by them, may be able to diſſolve it, and ſo make the Particles capable of receding at their Extremities, a Thing abſolutely neceſſary in the Elongation of a Bone: And ſo the Reaſon is obvious, why the good Women that pretend to cure the Rickets, apply their external Remedies to the concave Part of the Bone, when it is incurvated, which is where the Extremities of the Particles are united, and not diſpoſed to recede.

From this Suppoſition, that the Interſtices between the Extremities of the bony Particles, and the Liberty they have to recede upon the Preſſure of the nutritious Juice, are that which makes the Bones capable of an Increaſe. We may deduce alſo the preternatural Encreaſe and Knottineſs of the Ends of ſome Bones; for the Extremities of the articulated Bones being but tender Cartilages in Children, and ſome of them (as thoſe of the Wriſt) wholly cartilaginous, and not only ſo, but that medullary Oil and Mucilage which are ſupplied to them, which lubricate and moiſten thoſe Parts that are found thus nodous, keep their Particles laxe, and prevent their natural Tendency to an Union. In young Children therefore, where theſe Parts of the Bones are naturally ſoft, and the Extremities of the Particles kept more laxe and longer diſunited by a mucilaginous Matter than the other Parts of them, there is ſometimes (as in theſe rickety Caſes) a preternatural Laxeneſs, and conſequently a weaker Oppoſition to the Preſſure of the nutritious Juice; ſo that being protruded in an extraordinary Manner, they give Way for the Entertainment of a greater Quantity of this nutritious Juice, than what is neceſſary for their natural and regular Increaſe.

Concerning the *Gummata*, or the *Venereal* Nodes upon the Bones, they by a long Continuance take upon them the Nature of a bony Subſtance, which ſhews that they are produced by the nutritious Juice of the Bones, as by their material Cauſe, which being extravaſated, and caſt out upon the Surface, it adheres there, and produces a preternatural Excreſcency: For the nutritious Juice, after its Separation from the Maſs of Blood, flows in the Interſtices of the bony Strings; and ſo long as theſe Channels are entire, the nutritious Particles are kept within their Banks; but when once this Continuity of the Strings is broken by the leaſt preternatural Opening, then the nutritious Juice meets with a Paſſage to flow out at, into which the Rotation of the Spirits will carry them, and by the Succeſſion and Preſſure of one Particle upon another they are driven out of the Bones, where being out of the Reach of the direct Motion of the Spirits, their viſcous Nature diſpoſes them to adhere, and they generate a Subſtance like that of the Part which they are fit to nouriſh.

This is obvious in thoſe Caſes where the Fibres loſe their Continuity, and the ſmall Channels in which the Spirits move,

move, and the nutritious Juice flows, have any preternatural Openings, either by the Knife, as in Iſſues that are cut, or by the Corroſion of ſome ſharp or ulcerous Matter; for here the nutritive Parts contained in them are thrown into thoſe *Foramina* and Cavities, to repair the Loſs of what is deſtroyed, and to reſtore the natural Continuity of the Strings which are corroded; and even where there is no right Diſpoſition to healing, yet the Extravaſation of the nutritious Juice will diſcover it ſelf by the fungous Fleſh.

Now let it be conſidered, that the venereal malignant Ferments, which infect the Blood in the *French* Diteaſe, are both very volatile, ſubtil, and ſharp; ſo that when they are diſperſed through the Maſs of Blood, they will mix with any Humour, or at leaſt attend it, that is ſeparated by the Glandules, their Subtility being ſuch, that notwithſtanding the different Figuration of the Pores of diverſe Glandules, they will penetrate them; which is manifeſt from thence, that we ſee the malignant Particles in the venereal Diſeaſe to be diſcharged by the ſalivatory, urinary, pulmonary, and the nutritious Glandules of the fibrous Parts. As the nervous Threads are ſometimes corroded, and the nutritious Juice extravaſated off of their Interſtices, produces Caruncles in the fibrous Parts, ſo the ſame Particles, when they penetrate the Pores of the nutritious Glandules in the Bones, are intermix'd with the nutritive Particles in the Interſtices, by Means of their Subtility, and by their Acrimony corrode ſome of the Strings, and eat ſmall Holes in the Sides of their Interſtices, which when they reach to the Surface, open a Way for the Efflux of the nutritive Parts, which being driven thither by the Force of the rotatory Motion of the Spirits, as well as by the Preſſure of ſuch Particles as ſucceed them, they concrete, and produce an Excreſcency, repreſenting the Nature of that Part which they were fit to nouriſh.

The Third Diſcourſe of the Marrow, *and the Uſe of the Medullary Oil. Read* Jan. 29. 1689.

THE Cavities which Nature has formed within the Bones, are neither empty and uſeleſs Vacancies, nor fill'd with a contemptible Matter, but muſt be conſidered as Repoſitories for a curious refined Subſtance, neceſſary for the Service of the Parts that contain it, which is called the *Marrow*. The Nature of this Matter, which is here ſeparated and depoſited for the Service of the Bones, is altogether oleaginous; nevertheleſs the whole Maſs of the Marrow conſiſts of ſeveral Parts, to wit, of Veins and Arteries, of Glandules and containing Parts, and the oleaginous Matter that is contained in them.

It has its peculiar Blood-Veſſels. The Artery is ſometimes ſingle, ſometimes there are Two or Three, and ſometimes more in ſome Bones, eſpecially in the Ribs, having every one of them a diſtinct *Foramen* in the Side of the Bone for their Paſſage into the Cavities. It paſſes through theſe *Foramina* without any Ramification, for I could never obſerve that any of them did branch out into the Subſtance of the Bone for its Nouriſhment, they being deſigned peculiarly for the Marrow. After it has enter'd the large Cavity, or the ſmaller Caverns, (in the ſpongious Bones) it is commonly divided into Two Branches, one aſcending towards one Extremity, the other deſcending downwards the other: Both theſe Branches are ſo ramefied, as to impart a Twig to every Veſicle that performs the Function of a Glandule: For though I have with a Glaſs diſtinguiſhed ſeveral minute Blood-Veſſels belonging to a ſingle Bag, yet I cannot ſay I have obſerved that every Veſicle has a Blood-Veſſel, nor do I think it has; for there being a Communication between the Veſicles by Pores, there may be a Supply of the medullary Oil to fill thoſe that have not Blood-Veſſels of their own, in order to ſupply ſuch oily Parts, and do not ſeparate them themſelves.

As for the Veins, they run from the Extremities of the Arteries, ſome all along within the Marrow, to the *Foramen* through which the Artery enters, and fall into one large Channel, which paſſes through the ſame *Foramen*. Some tend to the Surface of the Marrow, and ſome of them, which are minute, paſs immediately through the Membrane, and ſo into the Side of the Bone; and theſe we muſt ſuppoſe to diſcharge them-

themſelves either into ſome Vein of the *Perioſteum*, or elſe into ſome of them which are in the Subſtance of the Bone, and belong to the nutritious Arteries; others run along upon the Surface of the Marrow, between that and the Membrane, and at laſt fall into that larger Channel which goes out by the *Foramen* of the Artery. Where there are two or more conſpicuous Paſſages, 'tis probable that ſometimes the Vein may paſs ſingly thro' one, and the Artery thro' another; but I have never yet obſerv'd it to be ſo.

The Organs deſigned for Secretion are ſmall veſiculous Glandules, being continually kept full by the Oil they themſelves ſeparate; wherefore I take them alſo to be containing Parts; but before I give an Account of them, I ſhall ſay ſomething concerning a common containing Part which inveſts the whole *Medulla*. The Oleaginous, the Veſiculous and Vaſcular Parts of the Marrow, are all contained in one common, very thin, and tender Membrane, tranſparent as Glaſs, which inveſts that Part as well that lies in the leſſer Cavities or bony Cells, as that which fills the larger Cavities. This Membrane doubtleſs has its Riſe from the Blood-Veſſels, there being no other Membrane here, no Nerves, no Tendons, nor Muſcular Fibres, from whence it can be ſuppoſed to be propagated. Neither do I think it has its Origin from all the Blood-Veſſels, but only from the Arteries; nor from all the Tunicles of the Arteries, but only from its exterior Coat, it being an Expanſion and an Elongation of the Fibres of that Coat; for it is ſo thin, that its Fibres ſeem not to be made of more than thoſe of one Coat: Neither have I been able ever to obſerve, that it is diviſible like the ſeveral Coats of an Artery; or that it has the leaſt Reſemblance to any of them, unleſs to the exterior one, it being apparently a *Reticulum* or fine Net of the ſame Texture with that.

In ſome Places it appears red, as if it contained a great many Blood-Veſſels; but this Redneſs is not occaſioned by any ſanguiferous Veſſels of its own, but by ſome of the Medullary Veins ſpread upon the Surface of the Marrow which lies under it, which, by Reaſon of its tranſparency, make it ſeem to retain that Colour which it only tranſmits. I muſt confeſs, I have not been able always to ſeparate this Membrane from thoſe Veſſels which give it that Colour; for where the Marrow is ſoft, they will riſe with the Membrane when it is ſeparated from the Marrow; and it is no wonder, ſince it is propagated from ſome of the Blood-Veſſels, ſo that there is a Connexion; and the Implication of theſe with others, will eaſily make them riſe together; and the Membrane is ſo tender, that it is impoſſible to ſeparate them afterwards. But as I have often ſeparated them in that Part of the Marrow which has not been ſo ſoft, and afterwards viewed the Veſſels upon the Surface of the Marrow; ſo I may certainly affirm, that they are not a Part of the Membrane, but only ſubjacent to it, and ſo impart their own Colour to it as an opace Body will do to that which is diaphanous when it is placed behind it.

This Membrane adheres to the Bone, not only by thoſe ſmall Veins which I told you before are continued from one into the other; but likewiſe by inſinuating it ſelf into the tranſverſe Pores of the firſt internal *Lamina*, which, I ſuppoſe, may be for the more convenient Paſſage of the medullary Oil through one into the other. So much is certain, that it has Pores by which this Oil paſſes through it into the Bone it ſelf; and theſe Pores are doubtleſs formed in thoſe Parts of the Membrane which are inſinuated within the Pores of the firſt *Lamina*; ſo the Sweat, after it is ſeparated by the cutaneous Glands, paſſes through the *Cuticula* by ſuch Pores. By the Elevation of this Membrane, to inſinuate it ſelf into the tranſverſe Pores of the Inſide of the Bone, are formed little round Protuberances in ſeveral Places, which render the Surface of the Marrow unequal.

Neither does the Medullary Oil contained in this Membrane lie undiſtinguiſhed in that Space which is circumſcrib'd by this common Membrane; but there are certain Diviſions and Subdiviſions within its Compaſs: For in the Membrane are immediately contained membranous Bags, and in theſe Bags are *Veſiculæ*, or ſmall Bladders; both which I have obſerved where the Marrow has been ſoft, and the Oil continued liquid after it was cold. And when I came to examine that Part of the Marrow which was indurated, I found that when it was made hot and liquid, the Structure of the containing

taining Parts was exactly the ſame, only I could not diſtinguiſh the tender Bags ſo well.

Theſe Bags or Lobules compoſed of ſeveral Veſicles, are neither of the ſame Capacity, nor of the ſame Figure, not even in a large Maſs of Marrow; and thoſe which fill the ſmaller Caverns or Cells, 'tis evident they are not only differently figured, but alſo of a different Extenſion, as the Caverns themſelves are ſo; and in ſome of the ſimple Cells, which are very little, that which fills them can ſcarce be call'd properly a Bag, becauſe in ſome there can't be more than two or three Veſicles, and in ſome ſcarce above one.

The *Veſiculæ*, or ſmall glandular Bladders deſigned for the Separation of the Medullary Oil from the ſanguineous Maſs, and for the Reception of it, are, as far as ever I could obſerve, all of them round and of the ſame Capacity. In that Part of the Marrow where the Oil is fluid, they appear very much like the veſiculous Subſtance of the Lungs when they are blown up, but that the *Veſiculæ* are not ſo capacious. In a ſmall Piece of the Marrow where this Oil is indurated, they repreſent, thro' a Magnifying-Glaſs, a Cluſter of ſmall Pearl ſticking cloſe to one another. In a humane Bone, which I had kept till all the Oil was evaporated, I found theſe *Veſiculæ* remaining dry, but entire, and their Subſtance not unlike a Spunge. The Medullary Oil being diſtributed within ſeveral ſmall Veſicles, hence it is that when any one of the Bags is opened, the Medullary Oil does not guſh out all together, but ſtills forth only in ſmall Quantities, and gradually, becauſe tho' the Membrane of the larger Bag be broken, the *Veſiculæ* remain entire, and contain the Medullary Oil; ſo that only ſuch a Quantity of it flows forth at a Time as their Pores will permit to paſs through them.

Theſe ſmaller Veſicles ſeem to have immediate Paſſages out of one into another, (as well as the larger Bags) by which the Oil has a free Paſſage to the Joints, and Subſtance of the Bone. Even from the middle Part of that Medullary Maſs which fills the large Cavities, and lies at ſome Diſtance from the interior Part of the Bone, as well as from the leſſer Cells. For if you melt a large Piece of the hardeſt Marrow over the Fire, the Oil will by Degrees drop all away, and leave both the Bags and the Veſicles empty; which plainly diſcovers ſome Paſſages from the interior Part to the Surface. If, beſides this, we conſider the Diſtance of the Bags and Veſicles in the middle of the Marrow in the large Bones, (as for Inſtance in that of the Thigh) from the Subſtance of the Bone and their Articulations, unto which it is to give a Supply, we muſt conclude, that there is ſome Way of Conveyance of it to thoſe Parts; for without it all the Medullary Oil, excepting that which is contained in the Veſicles next adjoining to the common Membrane, would prove uſeleſs to thoſe very Parts for whoſe Benefit it was deſigned.

It being therefore beyond all Diſpute that there is a Motion and Paſſage of the Oil in the *Medullæ* from one Part to another, this muſt either be by peculiar Ducts made for that End, or elſe by Pores formed in the *Veſiculæ*, by which the Oil paſſes immediately out of one into another ſucceſſively, till it is conveyed either to the Joint or to the Subſtance of the Bone. By the ſtricteſt Enquiry I have been able to make, I never could find any Thing like Ducts, neither could I indeed ever obſerve the Pores by which I told you the Medullary Oil had its Paſſage; nevertheleſs ſince it is more than probable, that if there were any ſuch Ducts leading from the ſeveral Glandules, we ſhould ſee them, as we do in other Glands, met in larger Channels; whereas the Pores being every where exceeding ſmall, they can't offer themſelves to our Sight; there is much more Probability for the Conveyance of the Medullary Oil by the Pores, than by peculiar Ducts. Add to this, that this Oil is not carried from the Veſicles or Glandules to one large Receptacle, which would require the Conveniency of Ducts to convey it further; but it iſſues out of the Surface of the Marrow in as many Places as there are tranſverſe Pores in the internal *Lamina*. So that we muſt ſuppoſe theſe Ducts to be almoſt innumerable, as well in their firſt Riſe from the Glandules as in their Termination, which ſeems to be not agreeable to the wiſe Methods of Providence, ſeeing there is, or at leaſt may be, a more eaſy and ſimple Way for the Conveyance of the Medullary

dullary Oil; for as the Veſicles in every Bag, and the Bags in the common Membrane, lie contiguous to one another, this affords a ſufficient Conveniency of forming ſuch immediate Paſſages out of one into another as I have ſuppoſed already.

The Bags, as well as the glandular Veſicles, are doubtleſs derived from the Blood-Veſſels; for, as I told you before in Relation to the common Membrane, there are no other Parts from whence they can have their Riſe. Beſides this, they ſeem not only to owe their Origine in particular to the Arteries, but alſo to their exterior Coat. For their membranous Subſtance is altogether tranſparent, in the ſame Manner as the common Membrane is, neither does there appear the leaſt Difference in their Texture.

This makes me conclude, that the exterior Coat of the Arteries, expanded and conveniently diſpoſed and modified, makes the Veſicles, and that from its farther Expanſion ariſe the Bags, and from its Expanſion beyond all theſe, at laſt is produced that Membrane which includes the whole.

We may alſo rationally conclude, that beſides the Preſſure of the Medullary Oil (which is ſupplied without Intermiſſion) upon that which was ſeparated before, and depoſited in the Veſicles, to puſh it on towards the Subſtance of the Bone, and towards the Joints in ſome of them, when the Veſicles and the larger Bags are filled to a convenient Diſtention, they contract themſelves; (juſt as the Fibres of the Bladder and other membranous Cavities evidently do upon the ſame Occaſion) whereby the Oil is ſqueezed out at one Veſicle, and out of one Bag ſucceſſively, whereby that Part which is contained in the Veſicles that lie next the Membrane, is driven through it into the tranſverſe Pores of the firſt interior *Lamina*, and that which was more remote, is carried on towards it, and ſupplies the Place of what is removed.

How it is diſpenſed afterwards, we have ſhewn before; but we muſt not neglect here to give an Account alſo of the Paſſage of this Medullary Oil to the Joints; I mean how it makes its Exit out of the Bones, and enters into the Interſtices of the Joints. That there is a Paſſage into them, is evident; for if you preſerve a Joint entire till all the Mucilage is waſted, you may find even in the Fingers (whereof I have not been able hitherto to diſcover any large Paſſages) for a conſiderable Time after, an Oil tranſuded and ſticking cloſe to the Ends of the Bones, which is ſupplied from their Cavities even after a Man is dead, whereas the Separation and Supply of the Mucilage ceaſes immediately with the Circulation of the Blood, and that which is left in the Joint diſappears ſoon after.

For this End there are Pores or Paſſages framed, both at the End of the Bone, and in the *Sinus's* of it which are on one Side. Thoſe which are at the Extremity, which ſeem cartilaginous, are exceeding ſmall, but numerous, and hardly to be diſcovered; yet I have a Bone of a Horſe where they are plainly conſpicuous. And here I judge the Paſſage of the Medullary Oil to be in the ſame Manner as where the *Laminæ* are contiguous in the Sides of the Bones; *viz.* by tranſverſe and longitudinal Pores; ſome of the Paſſages in ſome *Sinus's* are plainly diſcoverable, eſpecially in the hinder Part of the *Os Femoris*, at the Ham, there is one which I opened, and traced for ſome Way up into the cavernous Part of the Bone: And in the large Cavity, on the poſterior Part of the *Trochlea* of the Shoulder-Bone, there are in moſt Skeletons ſeveral, ſometimes Six or Seven, one whereof is larger than the reſt. I did examine one that was conſiderable firſt with a Briſtle, and found there was a free Paſſage down a great Way into the Bone, which when I opened proved a bony Duct, that run for ſome Way into the cavernous Part, which, beſides what it had at its End, had on every Side ſeveral Pores that opened into ſo many of the Caverns. I have found Eight or Nine of theſe Paſſages in the ſame Cavity in the *Os Humeri* of a Horſe, and theſe pretty large, with ſeveral others that were diſcernable by the naked Eye.

By theſe Pores, the Medullary Oil ſeparated in the Cavities flows into the Duct, and by that into the Interſtices of the Joints. The Opening of this Duct in the Joint is very large in ſome Animals. In a Calf, where it was ſingle, I obſerved it to be larger than that thro' which the Medullary Veſſels paſſed into the Cavity. In fatted

Beaſts, (and ſo doubtleſs in very corpulent Perſons) there lies over it ſomething like a fat Gland, fixed as it were by a Root into this Paſſage; but upon a ſtrict Enquiry found it to be no Gland, but only a Piece of Fat: For as the adipoſe Glands between the Muſcles, ſo the Veſicles of the Marrow, may often ſupply a greater Quantity of this oleaginous Subſtance than is expended, eſpecially when the Animal is fatted, and kept without Exerciſe; and therefore it is not ſtrange to find ſomething of it ſticking upon the Bone, and a Superfluity of it even in the Joint.

I think I need not enlarge my ſelf upon the Nature of that Matter which is contained in the Bags and Veſicles, it being ſufficiently known to be an Oil, nor upon the Manner how 'tis ſeparated, ſince what has been ſaid of Glandular Secretion in general is ſufficient to explain it: But there are ſtill Two Things very well worth our Obſervation, (before we come to the Uſes of this Medullary Oil) *viz.* The Difference there is between the Colour of that Part of the Marrow which is in the large Cavities, and that which lies within the bony Cells, eſpecially in ſome Animals; and Secondly, the different Conſiſtency of ſeveral Parts of the Marrow when they are cold.

As to the Diverſity in their Colour, which, where it is indurated, is of a whitiſh Colour mix'd with Red; and the other plainly Red: This muſt needs proceed from the Difference in the Number of their Blood-Veſſels. For in that Part of the Marrow which lies within the large Cavities, I do ſuppoſe that every Veſicle has not an Artery to convey the Blood which furniſhes the oleaginous Particles, nor a Vein to carry it back, there being ſome which have this oily Matter that fills them ſupplied by Pores from the other Veſicles that ſerve for the Separation of it: Whereas on the other Hand, the Veſicles in the leſſer Cells have every one of them their ſanguineous Veſſels for this End, which makes them proportionably more numerous, and conſequently more red.

As to the different Conſiſtency of the ſeveral Parts of the Marrow, it is to be obſerved, that in the large Cavities of ſome Bones, ſome of the Marrow, after it is cold, is indurated in the Nature of Sewet; and at the ſame Time ſome of it remaining liquid, even in the ſame Cavity Now Oil in its proper and natural Conſiſtency being liquid, as well when it is cold as when it is hot; ſo that Part of the Medullary Oil that remains liquid, appears to be more pure and unmixed, as the other that is congealed has ſome Addition to it, which introduces this Alteration in its Conſiſtency.

The ingenious Dr. *Grew*, in his Diſcourſe of the Power of Mixture, gives us an Experiment how the Fat of an Animal Body may be imitated, and this Change effected in common Oil. His Words are theſe: 'Take Oil *Olive*, and pour it upon high 'Spirit of *Nitre*, and digeſt them for ſome 'Days. By Degrees the Oil becomes of the 'Colour of Marrow, and at laſt is congealed 'or hardened into a white Fat or Butter, 'which diſſolveth over the Fire as that of 'Animals. In converting Oil thus into 'Fat, is to be noted, that it hardens moſt 'upon the Exhalation of ſome of the more 'ſulphureous Parts of the Spirit of *Nitre*.

'Hence the true congealing Principle is 'a Spirit of *Nitre*; and the making of 'Fat is but the durable Congelation of 'Oil.

'Hence alſo it appears, that Animal Fat 'it ſelf is but the Curdling of the Oily 'Parts of the Blood, either by ſome of its 'own ſaline Parts, or by the nitrous Parts 'of the Air mingled therewith.

The Reaſon then of this Difference in the Conſiſtency of ſome Parts of the Marrow, and of the Congelation of that which is found indurated when it is cold, is the Mixture and Continuation of the Nitrous Parts of the Air with it, fixing the Particles of it; ſo that if any of this indurated Marrow be deſtill'd *per ſe*, it will, after it is brought over and cold, return to its ſolid Conſiſtency. However, by ſetting it afterwards in the Sun for a conſiderable Time, I have brought ſome of it to the Nature of a true Oil, which remained liquid after it was cold.

The

The Fourth Diſcourſe of the Mucilaginous Glands. *Read* November 20. *and* 27. 1689.

THE next Thing I am proceeding to give an Account of, are a peculiar Sort of Glands in the Joints, which ſeparated a mucilaginous Kind of Liquor, and nevertheleſs have never been deſcribed or obſerved by any one before, only that ſome Time after I had made my Obſervations of them I met with one Mr. *Cowper*, an ingenious Chirurgeon of *London*, who had taken particular Notice of the larger Sort of theſe Glands. For after having found the Nature of this Liquor in the Interſtices of the Joints to be always mucilaginous, and vaſtly different from the Marrow or an Oil *Perſe*, (though it might have the Acceſſion of an Oil) I could not but think that it muſt have ſome peculiar Parts to ſeparate and ſupply it. This made me enter upon an Enquiry, whether there were no particular Secretory Organs for its Separation, and ſo upon a ſtrict Examination of the Interſtice and the Membrane which immediately covers the Articulation, I diſcovered in the *Sinus's* of the Bones within the Joint ſome ſoft Parts, which to the Touch ſeemed veſicular and ſpongeous, and that the Membrane was not only laxe, but alſo unequal, with Protuberancies of a different Figure and Magnitude. As it was looſe and eaſily extended, where the Ligaments would not permit the Extremities of the Bones to recede from each other, it was evident, that it ſerved not to their Conjunction, nor was this Uſe conſiſtent with an Articulation; for did the Membrane which lies round the Joint tie the Bones together, this muſt have fixed the Part, which is to be moved, on every Side, and conſequently have render'd it uncapable of a Flexure, or any natural Alteration in its Poſition. The Protuberancies I mentioned juſt now gave me the Suſpicion of Glands, and I ſoon was convinced that the Membrane was truly glandulous, and that the ſoft Bodies within the *Sinus's* were actually Glands; and beſides, the Reaſon I had to think that theſe were the ſeparatory Organs of the Mucilage, I was ſoon ſatisfied in the Truth of this when I ſqueezed ſome of it out of them.

Now becauſe they had not been taken Notice of, I judged I could not give them a more proper Name than that of *Glandulæ Articulares:* But becauſe I obſerved the ſame Sort of Glands alſo between the Muſcles and the Tendons, and that there are Glands ſeated in the Throat, which ſeparate a Mucilage for the Lubrication of our Food, and facilitate its Deſcent into the Stomach, I have given them a more comprehenſive Name, ſuch as *Glandulæ Mucilaginoſæ*, or the Mucilaginous Glands.

Of theſe I ſhall firſt give a Deſcription, and an Account of the Structure and particular Situation of thoſe which are moſt conſiderable. Secondly, I ſhall take into Conſideration the Nature and Deſign of the mucilaginous Liquor ſeparated by them, and ſhew how great a Quantity of it as is neceſſary for the Uſe of ſo many Parts as it is employed in, is continually generated. Thirdly, I ſhall give an Account of ſome Experiments I have made with it, and of a Diſtemper or Two which owe their Origin in a great Meaſure to theſe mucilaginous Glands.

Theſe Glands are of Two Sorts; ſome are ſmall and numerous in every Joint, being ſet thick all over the Membranes, excepting where there are any large Glands. They are all of an equal Bigneſs, ſo as to render it every where glandulous, which is not extraordinary in a Membrane, when there are Tunicles which are evidently ſo; for the ſagacious *Malpighi* has diſcovered the *Tunica Vaginalis* of the *Teſtes*, the *Capſula* of the Heart, the *Peritonæum*, and the *Pleura*, to be all ſo: But in ſome Parts of the Membrane, and in the Cavities of the Bones in the Joints, theſe Glandules are ſo conglomerated, as to form remarkable Glands, and theſe I am now to deſcribe.

In ſome of theſe large Joints there is only one, as in the *Acetabulum* of the Thigh-Bone, which is a very conſiderable one; but in ſome, as in the Knee, there are Four or Five. They have ſomething of a tranſparency when they are diſcoloured by Blood-Veſſels. This they have from their Baſis for ſome Way upward to their other Extremity. In Horſes, and ſuch large Ani-

mals, where they riſe any conſiderable Height above the Surface of the Membrane, but near to the upper Part, and ſo to the very End, they receive a red Colour from their numerous Blood-Veſſels: But in Men they are moſt commonly all over of a red Colour, which however is more intenſe about their Extremities. They are ſoft and pappy, but not tender and friable, like the glandulous Subſtance of the Liver, and ſome other Glands of the Body, and conſequently are not eaſily broken by any Compreſſion: And it was but neceſſary it ſhould be ſo, they being ſeated betwixt ſuch Parts as being hard preſs'd upon them in their Motion, though it be ſo lightly as not plainly to compreſs them. Neither are the Parts of theſe Glands eaſily torn aſunder; perhaps the mucilaginous Quality of the Humour which they ſeparate makes their Parts both flexible and viſcous, all which oppoſes their Friability.

As for the Structure of theſe Glands, I had an Opportunity of examining ſome of them, which I took out of the Joints of a Horſe, that were hydropical, and fill'd with a preternatural Humour, which diſtended their Glandules, and made them appear very plain with the Help of a Microſcope, one whereof was as large as a Man's Hand. They were conglomerated, but did not conſiſt of ſeveral Bags of leſſer Glandules, as ſome other Glands do, but of ſeveral Membranes, ſuperſtrated one upon another, ſet thick with round ſmall Veſicles, which are not only contiguous, but alſo tenaciouſly adhering to one another, as do likewiſe the ſeveral Membranes. Upon examining of the mucilaginous Gland in the *Acetabulum* of the *Coxendix* of a Man (after it was dried) I found the Structure of theſe Glands to be the ſame in Men as in Beaſts; for I could diſcern and divide Six or Seven ſeveral diſtinct Membranes: So that though the Glandules are here conformed to thoſe of the Marrow, the Lungs, and ſome other Glands, ſo far to be of the Nature of Veſicles, yet the Order in which they are diſpoſed is very different. By the Pores of theſe ſmall Veſicles, the mucilaginous Liquor is percolated and ſeparated from the reſt of the Maſs of Blood, which is carried to them by the Arteries, and from them iſſues into the Interſtices of the Joints by the excretory Paſſages, which all the Glands have.

They are provided with a ſufficient Number of Blood-Veſſels, eſpecially towards their *Apex* or Extremity, which make them look of a redder Colour there than at their Baſis. Their Veins proceed obliquely with Windings and various Flexures as they run along in the Gland. The Nature of the Liquor which is ſeparated by theſe Glands ſeems to require this Obliquity of the Veins, for it obtaining a mucilaginous Quality, the Particles of it do not ſeem to paſs through the glandular Pores very quick, and therefore theſe Veſſels are made with ſuch Windings, that the Return of the Blood by them may be retarded, and the Particles to be ſeparated may not want Time to penetrate the Pores of the Glandules. The Figure of the mucilaginous Glands is very different, and accommodated to the Cavity in which they are placed. Some are both long and broad at their Baſis, and become narrow towards the Top, ſo as to end in an Edge. Some have a broad Baſis, and riſe into a Sort of Cone. Others are like ſmall Ridges; others like a *Fimbria*, and others again broad and pretty flat.

They are differently ſeated in the ſeveral Joints. In ſome they are placed over-againſt the very Interſtice of the Bones, and run in a little Way between them, where the Extremities of the Bones towards that Side are not contiguous, but ſo framed, as in their Conjunction to make an Interſtice, and theſe are commonly in the Manner of a *Fimbria*. Some are ſeated in ſome Cavity; others upon the Membrane which immediately covers the Articulation: But in general they are ſo planted, that they cannot ſuffer by the Compreſſion from the Bones; notwithſtanding that, the Bone, either in the Inflexion or Extenſion of the Joint, does preſs (lightly) upon them, ſo as to promote the Excretion of the Humour which they ſeparate into the Joints when they are moved. And thus it ſeems to be moſt plentifully ſupplied when there is Occaſion for the greateſt Quantity of it in proportion to the preſent Exigency, and according to the ſeveral Degrees of Motion in the Part when it is moved. Beſides that,

that, it is no ſmall Security to theſe Glands, againſt the Obſtructions which the mucilaginous Quality of the Liquor that they ſeparate might be apt to produce in them, that they are ſolicitated, and this Liquor ſqueezed out of them by the Motion of the Parts where they are ſeated.

As for the particular Situation of the large and conſiderable mucilaginous Glands in the ſeveral Articulations, ſome of them are planted round the Tooth-like Proceſs of the *Epiſtropheus*, the Second *Vertebra* of the Neck, and one on each Side. They are alſo to be met with in both the Articulations of the Ribs with the *Vertebræ*, but the largeſt is in the lower Articulation, and on that Side which is next the Concavity of the *Thorax*. Theſe are but ſmall Glandules, though they are of the larger Sort, that is, they are formed of ſeveral Glandules, conglomerated and ſeated upon one another in ſeveral Membranes, and ſo to be diſtinguiſhed from thoſe that are but ſingle Glandules, which only ſtand one by another in the Membrane of the Joints, and make no conſpicuous Inequalities in it. In the Joint of the Shoulder there is a conſiderable one adjoining to the upper Edge of the *Acetabulum* of tht *Scapula*, juſt by the tendinous Origin of the *Muſculus Biceps*, on the fore Side of it, which runs downwards upon the Membrane for ſome Way towards the Armpit; and on the other Side of that Origin there is another at a ſmall Diſtance from it. In the Cubit there is one Gland, placed in the Cavity which is on the poſterior Part of the *Trochlea* of the *Os Humeri*; and another large one in one of thoſe *Sinus's* which are on the fore Side of the ſame *Trochlea*, which I have given a Figure of, *Fig.* I. *Tab.* II.

Upon the *Radius* and *Ulna* there lie ſome of theſe Glands like a Ridge; and at the Articulation of the Bones of the Cubit and the Wriſt there is a Row of them, or rather one of them, lying like a Ridge of ſmall Hills from one Side to the other on the back Part. On the Inſide there are ſome alſo, but not ſo conſiderable; and ſome are at the Bones of the *Carpus*, which are like a *Fimbria*. The *Acetabulum* of the *Coxendix* has one of the largeſt of this Sort of Glands in the whole Body: But becauſe the Cavity is deep, and the Brow that encloſes the Edges of it runs ſo far over the Head of the Thigh-Bone, and lies ſo cloſe to it, that the Mucilage could not have penetrated in any great Quantity into the Cavity, nor readily been diffuſed for the Lubrication of the Head of the Bone, which is received into it, if the Gland had been ſeated, and the Mucilage ſeparated out of that Cavity; therefore the Gland which ſupplies it to this Joint is placed within it, and lies between the Extremity of the Head of the *Os Femoris* and the *Coxendix*.

As this was neceſſary, ſo on the other Hand it muſt be ſubject to an Inconveniency, had not the Providence of Nature provided againſt it; for if the Cavity had been all over exactly fitted to the Head of the Thigh-Bone which it receives, without a peculiar Regard to the Poſition of this Gland, and the ſaid Gland had been ſeated within it, as now it is, it would of Neceſſity (eſpecially whilſt we are in a ſtanding Poſture) have ſuffered a Compreſſion, to the Deſtruction of the Tone of its Glandules, and ſo have been render'd uncapable of performing its Function. 'Tis upon this Account that there is a Cavity at the Bottom of the *Acetabulum*, formed on Purpoſe to receive and ſecure it beyond the violent Preſſure of the Thigh-Bone. This Cavity is in a humane Skeleton almoſt of an oval Figure, which I have found an Inch and Five Eights in Length, and in the wideſt Place very near one Inch one Eight in Breadth, and about Three Eights of an Inch deep, occupying at one End and on both Sides only the Bottom of the *Acetabulum*, but at the other End it runs up by the Ligament which is inſerted into the Tip of the Head of the *Os Femoris* to the Edge of the Cavity.

In the Knee there are of theſe Glands both before and behind. Above the *Rotula* there is one, and at the Bottom another very conſiderable one, and on one Side another that is leſs; all which I have given a Deſcription of, *Fig.* II. *Tab.* II. where *A*, *A*, *A*, *A*, are the fore Part of the Knee taken off with the *Patella*, and the Inſide turn'd up and laid in View, *a*, *a*, *a*, are the large mucilaginous Glands, *b*, *b*, *b*, *b*, the Membrane which immediately covers the Interſtice of the Joint, and *c* is the *Patella*.

As

As for the Glands of the Fingers and Toes, they are ſeated at the Inſide or bending Part, where they are like a *Fimbria*; and in every Joint there are Two of theſe glandulous *Fimbriæ*, one belonging to that which is the moving Bone when the Poſture of that Joint is altered, being ſeated juſt at the Edge of its Extremity, the other being placed upon the Bone with which the other is articulated, at a ſmall Diſtance from the Extremity of it, up in a Cavity, formed as well for the Reception of the Gland, as to give the other Bone, when it moves that Way, the Liberty of ſliding towards it, and of being inflected, at which Time it makes ſome light Preſſure upon it.

But beſides theſe, I have obſerved the ſame Sort of Glandules in the *Membrana Communis Muſculorum*, as thoſe which occupy the Membrane that lies over the Joints in all that Part which has none of the large Glands: And amongſt many of the Tendons there are ſeveral of the larger Glands, or rather the leſſer Glandules conglomerated into the Form of Glands; ſo that I dare poſitively aſſert, that this *Membrana Communis Muſculorum* is every where glandulous: For in that Subject where I had ſome hydropical mucilaginous Glands, I obſerved ſeveral Parts of the Membrane of the Muſcles in the ſame Manner hydropical; and here it not only upon an ordinary View appeared like the hydropical mucilaginous Glands, which I took out of the Joints of the ſame Subject, but when I came more narrowly to view the Structure of it with the Help of Glaſſes, (which the Diſtention of the Glands gave me a fair Opportunity of doing) I found, that as it had ſmall Veſicles or Glandules, ſo were they exactly like thoſe of the mucilaginous Glands of the Joints, there being only this Difference, that the Glands conſiſted of more Membranes.

The Fulneſs and Swelling of the hydropical Glands which I met withal, makes me imagine, that in the Dropſies of the carneous Parts, the common Membrane ſometimes contributes to it, and that there is now and then a particular Dropſie between the Muſcles, where the Water is ſupplied by theſe Glands only, Part of which flows out of them into the Interſtices, and Part is retain'd in the Veſicles, which diſtends them in an extraordinary Manner, and by making a preternatural Addition to the Craſſitude of the Membrane, produces a Swelling in the Part.

The larger Sort of theſe Glands about the tendinous Parts are very remarkable in Beaſts of a conſiderable Magnitude, eſpecially where there are any long Tendons, which ſlide backwards and forwards in a *Sinus*, upon the Contraction and Extenſion of their Muſcles.

Of the Nature and Uſe of the Mucilage.

THE Liquor ſeparated by the Glands which I have now deſcribed, is not unlike the White of an Egg, only that it is not always ſo clear and limpid. In ſome Beaſts it has a yellowiſh Colour, as if it were mix'd with ſome Bile. It is ſaltiſh to the Taſt, and compoſed of aqueous, ſaline, and gummous, or ſuch terreſtrial Parts as have no Rugoſities or Inequalities, nor incurvated Extremities; ſo that they are apt to ſlip upon one another; yet they have ſo much of an immediate Contiguity, as makes them in ſome Degree adhere, which gives them ſomething of a viſcous or mucilaginous Quality.

I have found the ſaline and terreſtrial Parts to be about a Two and thirtieth Part of the Compoſition, which is more than ſuch a Proportion as that muſt be of Gum-Arabick or Tragacanth, which with fair Water will make a Mucilage of the ſame Conſiſtency. The Nature of the Mucilage ſeems to approach very near to that of the ſerous Part of the Blood, which diſcovers it ſelf diſtinct from the *Coagulum* or fibrous Parts after it has ſtood for ſome Time in the Air; and ſeveral Mixtures will produce the ſame Effects in both. Neither is it ſtrange that they ſhould ſo nearly participate of the Nature of one another, if it be conſidered, that the Mucilage is ſupplied from the Blood, and a Part of the *Serum*; though there appears to be a Difference, in that the *Serum* is not ſo mucilaginous, as alſo from certain Experiments; from the *Serum* of the Blood will be more remarkably coagulated with

with Spirit and Oil of Vitriol, with Spirit of Sal, and Oil of Sulphur; and when they are held over the Fire in a Spoon, the Effect is very different. The *Serum* will in a Manner coagulate wholly into a thick Jelly or Size, which is friable, inſomuch that of a Dram, I have had, after it had loſt its Fludity, Two Scruples and Sixteen Grains, and after it was quite dried, Five Grains and a half, which is very near the Eleventh Part; whereas the Mucilage with the Heat of the Fire turns for the greateſt Part into a Liquor more tenacious than it is naturally, and produces only a Film upon the Top, with ſome little white *Coagulum*, and the Remainder, after the aqueous Parts are all evaporated, does not amount to the Thirtieth Part.

The chief Uſe of this Mucilage is to lubricate the Joints and the Extremities of the articulated Bones, in ſuch a Manner, that the Animal may move with the greater Facility as there ſhall be Occaſion. This ſeems to be the main, but not the only Thing, that thus renders and preſerves ſlippery the articulated Extremities of the Bones: For, beſides this mucilaginous Liquor I am now ſpeaking of, there is an oleaginous Subſtance from the Cavities of theſe Bones into the ſame Interſtices by Paſſages formed for this End, as has been ſhewn before in the Diſcourſe of the Marrow. Theſe Two are mix'd together in the Joints, eſpecially upon the Motion of the Part. Neither could any other Mixture be contrived more proper to anſwer this End than this, where both the Ingredients are not only of a lubricating Nature, but alſo mutually improve one another, the Mucilage increaſing the Lubricity of the Oil, and the Oil keeping the Mucilage from being inſpiſſated and contracting the Conſiſtency of a Jelly. In which we may in a peculiar Manner ſee and admire the Wiſdom and Providence of our great Creator, who has not only given ſuch a Structure to theſe Parts of the animated Beings as renders them fit for Motion, but alſo whatever may conduce towards the preſerving and facilitating their Functions.

This Mucilage is ſubſervient alſo to the Preſervation of the Extremities of the articulated Bones from Attrition and Incaleſcency: But becauſe I have ſpoken of this already in the Diſcourſe of the Marrow, it will be ſufficient to mention it only in this Place, and proceed to give an Account of the Uſe of the mucilaginous Glands, and Liquor between the Muſcles and the Tendons.

There is not the leaſt Doubt but that the Liquor ſeparated by the mucilaginous Glands placed between the Muſcles, and about the Tendons, was chiefly intended for the Lubricating of thoſe Parts, juſt as it is in the Joints: For if we conſider how the Contraction of the Muſcles not only obliges their Tendons to approach towards their Origin, but alſo draws up ſome Part of every Fibre towards their Beginning, ſo that they muſt needs ſlide backwards or forwards upon the *common Membane of the Muſcles*, which lies contiguous to them, as they are contracted or relaxed, and extended, we may ſoon be ſenſible how neceſſary this Lubrication is to the Muſcles. And in Regard of ſome of the Tendons which ſlip up and down in the *Sinus's*, as thoſe of the *Muſculi Perforantes*, which have their Inſertions into the Third Joint of the Four Fingers, as well as into the ſame Joint of ſo many of the Toes, ſome of the Flexors of the Leg, and ſome others, 'tis evident that the Mucilage is full as neceſſary to them as it is to the Joints.

Now taking it for granted, that this mucilaginous Liquor is employed in the Lubrication of the Muſcles and Tendons, as it is at the Ends of the articulated Bones, we may rationally conclude, that there is alſo in theſe Parts an Addition of an oleaginous Subſtance to preſerve the Mucilage from Inſpiſſation. This ſeems to be confirmed by Matter of Fact, conſidering the vaſt Numbers of adipoſe Glands, and ſuch Quantities of Fat, as are to be ſeen between the Muſcles in ſome Bodies: And in fatted Beaſts ſome of theſe adipoſe Glands are to be obſerved about the Tendons which move in a *Sinus*. And though ſuch a Quantity of Fat is not to be met with in all Bodies, yet that the ſame Glands are exiſtent in lean Perſons, can ſcarce admit of a Contradiction, no more than that they perform their Function of ſeparating a Fat ſo long as there are oily Parts in the Blood, which in the Circulation of the Blood will enter into thoſe Glands.

'Tis

'Tis true, the Reaſon of Leanneſs in ſome Men may be, becauſe the Quantity of Oil which is ſecerned by theſe Glands, is not ſo great as in thoſe that are very corpulent, as it is obſervable in aged People, weak Bodies, and even in thoſe that feed high, and uſe but little Exerciſe, and yet have a thin Habit of Body. Nevertheleſs it muſt be allowed alſo, that the Variation between fat and lean Bodies in this Reſpect is oftentimes owing to a Difference in the Expence of this Oil: For its Deſign being to be aſſiſting in the Lubrication of the Muſcles and Tendons, it follows, that it muſt be moſt expended in their frequently repeated and long continued Motions.

Hence it is, doubtleſs, that thoſe that Work hard all the Day, and have but little Reſt but the Repoſe of the Night, are ſeldom very fat, and yet have good Appetites, and enjoy a perfect State of Health; ſo that there is not the leaſt Reaſon to doubt but the Mass of their Blood ſupplies ſuch a Proportion of Fat, as would make them as corpulent as ſome other People, were it not that their laborious Life, and conſequently the frequent Motion of their Muſcles, is a Way by which it is continually expended; ſo that there is no Reſerve to be kept in the adipous Cells. And this we may often obſerve in thoſe Men, whenever they can indulge themſelves in an eaſie Way of Living, what an Alteration it introduces in their Bulk. This is very evident in Horſes, which whilſt they have Reſt, and are well fed, grow fat, but if they work hard for any conſiderable Time, they loſe their Fleſh.

Since therefore this Notion of the Expence of the Fat upon great Motions or Exerciſe is plain, what remains to be enquired into here is, how this oily Subſtance is employed.

Dr. *Mayo* ſuppoſes theſe oleaginous Parts to be ſeparated from the Maſs of Blood by the *Parenchyma* of the Muſcles, and by a Congreſs with ſome *nitroaereous* Particles, or the Spirits conveyed to them by the Nerves, mutually exagitating each other, and producing an Effervescency to ſerve for the contraction of the muſcular Fibres: And in caſe the Muſcles are not ſo frequently contracted as to employ and deſtroy all theſe *ſaline ſulphureous* Parts in their Motion, that then they are conveyed by peculiar Ducts from the interior Part of the Muſcle to convenient Receptacles, in which they afterward are collected in the Form of a Fat. To ſtrengthen his Suppoſition, and that theſe Parts are ſeparated in the *Parenchyma* of the Muſcle, he alledges, That the Blood-Veſſels which are diſperſed through the Body of a Muſcle, are never propagated ſo far as the Fat; ſo that the Parts which conſtitute it cannot be immediately ſupplied from them to thoſe Parts in which we find it.

But this Argument is ſoon overthrown, for though the Blood-Veſſels are not ſo numerous in the Fat as in ſome other Parts, yet there are ſome which are even viſible, as alſo the Glandules which ſerve for the Separation of theſe oily Particles. And I have obſerved ſome adipous Glands about the Tendons, at a great Diſtance from the carneous Fibres. We alſo find in the Cavities of the Bones, a Subſtance of the ſame Nature; where it is certain, that it can neither be ſeparated by the *Parenchyma* of any Muſcles, nor act in Conjunction with the Spirits in their Contraction, but concurs with the Mucilage to preſerve it from Inſpiſſation: And it being requiſite for this End in the Joints, it is no leſs neceſſary in any other Part where the Mucilage is employed. But if theſe ſulphureous Parts are expended and deſtroyed in the Contraction of the muſcular Fibres, then muſt they be wanting to this Liquor when it is moſt plentifully ſupplied, and there is the greateſt Occaſion for them upon the external Part of the Muſcle; ſo that I rather think, that the Firſt Intention of this Fat is to make up ſuch a Compoſition as is qualified to lubricate the Parts in Conjunction with the Mucilage.

Beſides the Lubrication, the Mixture of the Mucilage with an oleaginous Subſtance preſerves alſo the Muſcles and Tendons from ſhrinking, from growing dry and rigid. Hence it is, that in Rheumatiſms, when it contracts a Viſcoſity and thick Conſiſtency, ſo as to render it unfit to moiſten theſe Parts, there is obſerved a certain Stiffneſs and Stupor, of which more hereafter.

Of the Generation of the Mucilage.

THE Matter of which this Mucilage is made is originally from our Food, and the Chyle, which is daily added to the Maſs of Blood; but theſe Parts of which it is generated do undergo a very great Alteration before they arrive to the Nature of a Mucilage. And as this Change which that Part of the Blood from which it has its Origine ſeems to be owing to ſome Gland, ſo there is none that I can judge ſo well qualified for this Work as the *Spleen*, which I ſuppoſe to be the *Officina* where Nature elaborates the Mucilage, from whence it is adminiſtred to the Blood, and afterwards diſperſed in its Circulations to all the Parts where it is to be employed.

This I have been thinking, That this large *Viſcus* is deſigned for ſuch a Function, that it is not abſolutely neceſſary to the Life of Animals, ſince the Privation of it is not only conſiſtent with Life, but that even the Animal ſeems but little concerned for the Want of it. This Experiment has not only been made in Dogs, but there are ſome alſo which affirm, (if we may credit them) That it has been wanting in ſome Men, and taken out of others, who have been happily reſtored to their Health.

And thus far this Gland and the Uſe which I aſſign to it agree, ſince that Function which I attribute to it is not ſo much requiſite to the Being as the Well-being of an Animal: For ſuppoſing the Mucilage to depend wholly upon the Function of this Part, we may eaſily conceive what is the Reaſon why the Animal is no more injured by the Want of it: For its Uſe being to lubricate the Parts, and there being no Parts about which it is employed but what have an Oil ſupplied to them, that anſwers the ſame End in ſome Meaſure, at leaſt the Inconveniency which may be ſuppoſed to follow upon the Want of one, is much counterballanced by the other: Though I am apt to think, that if an Animal deprived of the Spleen were afterward put upon great and frequent Motion, the Injury ariſing from the Want of it would ſoon appear; which is ſeldom obſerved now, ſince the Subjects in which this Experiment is commonly made are reſerved only for Diſſections.

As I make this an Argument for my *Hypotheſis*, that neither the Spleen nor the Mucilage are abſolutely neceſſary for the Preſervation of Life, ſo the Quality of that Juice which is always found in the *Parenchyma* of the Spleen, gives us ſome Reaſon to imagine, that it is deſigned for the Generation of this mucilaginous Liquor: For that it produces ſuch a Kind of Juice is obvious to our Senſes; and ſince it does exhibit ſuch a Liquor, it is reaſonable to believe, that it is for the Benefit of thoſe Parts that ſtand in need of it, and are manifeſtly ſupplied with a Liquor of ſuch a Nature as that is which is found in the Spleen. Neither is it ſtrange that a *Viſcus* ſhould be framed particularly for the Generation and Elaboration of this Mucilage, it being of ſo great Uſe to moſt Parts of the Body. Furthermore this Gland having no common Receptacle to entertain, nor any proper Ducts to convey the Humour after its Separation to other Parts, our Suppoſition will ſhew us the Reaſon why it hath neither; for one was inconvenient, and the other next to an Impoſſibility. It was not convenient that this Juice ſhould be carried into and reſerved in any Receptacle in or about the Spleen, becauſe it is placed at too great a Diſtance from moſt of the Parts to which the Mucilage is neceſſary, and conſequently could not be immediately ſupplied from any ſuch large Cavity upon any Occaſions that are ſudden or extraordinary, as our Motions oftentimes are. And as for the Ducts, it was in a Manner impoſſible that the Spleen ſhould be provided with ſo many of them, as would be requiſite to convey the Mucilage to all the Parts that ſtand in need of it; whereas, according to our Suppoſition, the Thing is done without them; for by its being communicated to the Maſs of Blood, it is brought into the ready Way of being diſpenſable to all the Joints, the Muſcles, and Tendons. And whatever Parts can be ſuppoſed to have Occaſion for it, ſince the Blood with which it afterwards circulates, in its Circulation through all the Parts of the Body, flows alſo to all the Glands, by which this Mucilage is ſeparated in every Part.

Now ſuppoſing the Spleen to generate this mucilaginous Liquor, let us ſee alſo in what Manner it does it, which I accidentally made an Obſervation of by an Experiment I made with the Mucilage. Deſigning to make a Tryal what Change an acid Auſtere would produce in it, I mix'd ſome Spirit of Vitriol with ſome of the Decoction of Galls, and I found that the Mixture made a ſoft and perfect Gum. Now as there are evidently gummous Parts in the Mucilage, ſo in the Spleen there ſeem to be ſupplied from the Blood Two Principles of the ſame Nature as thoſe were of, of which I made the Gum, that is, an Acid and an Auſtere, to produce it. *Diemerbroeck* tells us, That the Spleen when it is boiled has a ſubacid Taſte; and therefore I ſuppoſe that the Splenatick Glandules having Two Sorts of collatory Pores, do by one ſeparate an acid, and by the other an auſtere Juice, which meeting in the ſmall Cavities, they precipitate one another, in the ſame Manner as we have obſerved it in the Spirit of Vitriol and the Decoction of Galls, not into a perfect Gum, but only into a more thin Mucilage, the Difference whereof is owing to a leſſer Degree both of the Acidity and Auſterity. Thus having given you an Account of the Nature and Uſe of the mucilaginous Liquor, (however it is firſt generated) we muſt not forget to remember alſo, that as the other Glands of the Body, ſo theſe deſigned for the Separation of this Mucilage, do often alſo take off from the Maſs of Blood a morbifick Matter, which not being excerned out of the Body, is thrown upon ſome Parts, which are injured by it, and ſo does excite ſome particular Symptoms wherever it is lodged. Therefore all the Parts where any of theſe Glands are planted, muſt be obnoxious to Catarrhs, whenever they are diſpoſed for the Separation of a heterogeneous and morbifick Matter, and Nature endeavours to cleanſe the Maſs of Blood by them.

The mucilaginous Glands being placed both between the Muſcles and about their Tendons, and in the Interſtices of the Joints, this Defluxion of a morbifick Matter happens ſometimes to one, ſometimes to the other, and ſometimes to all of them, which when it is ſeparated from the Maſs of Blood by the mucilaginous Glands ſeated between the muſcular Parts, it produces a Rheumatiſm; when by thoſe which ſupply the Joints and Tendons, occaſions the Gout: And therefore I intend to ſay ſomething of both theſe Diſtempers; but before I enter upon an Explanation of their Nature and Cauſe, I think it requiſite to give an Account of certain Experiments I made with this Mucilage, that as the morbifick Humour which is the Cauſe of them mingles with the Mucilage, when it is diſcharged into the Interſtices, ſo the Alterations I might obſerve from ſeveral Mixtures made with this Mucilage, would lead us to the Knowledge both of the Nature of the Humour that cauſes the Diſtempers, and the Reaſons alſo of ſome Symptoms that attend them.

The Mucilage I made Uſe of in my Trials I took from the Joints of an Ox and of a Horſe, and theſe Trials I made both when it was hot and when it was cold. Vinegar drop'd into it when it was hot made a conſiderable Coagulation, beſides a *Serum*: To all this I added afterward the Powder of Coral, to ſee whether the Effervescency which would follow could diſſolve the *Coagulum*, or Curd, which the Acid had produced, but I found no ſuch Effect, no more than from the *Antimony Diaphoretick* Crabs-Eys, nor any Thing of a teſtaceous Nature that I tried. All the following Experiments I made with it when it was cold: I made the ſame when it was hot; but to avoid needleſs Repetitions, I will not enter upon a diſtinct Account of both, but obſerve only, that thoſe which were made with it cold did produce the ſame Effect when it was warmed, *viz.* a Coagulation with Acids and Stipticks, only in a higher Degree: And whereas the Coagulations which were made when it was in one State did only change it into a thick Jelly, without any *Serum*, in the Nature of a Cheeſe when it is newly ſet, which over the Fire afterwards exhibited Two diſtinct Parts, a *Coagulum* or Curd, and a Whey. In the other, where the Mucilage was hot, the Mixtures which coagulated it made a harder Curd, and a *Serum* diſtinct from it.

By dropping in ſome of the Decoction of Galls to ſome of it, the Whole was turned into

into a gelatinous Maſs, or a Sort of a *Coagulum* like a Skin, of a whitiſh Colour, and ſo tough as to hang all together when I took it up with a Needle. This *Coagulum* being dried in the Sun, the Parts of it ſtuck all together in one Piece, which was eaſily rubb'd to a Powder, very much like fine Flower. The ſame Effect produced the ſtrong Infuſion of *Balauſtica*, Red Roſes, Pomegranate, and the *Peruvian* Bark; only that there was ſome Difference in the Coagulations, according to the different Degrees of their Adſtringency.

With a few Drops of *Aquafortis* diſtilled upon it the Mucilage was immediately coagulated, though the *Coagulum*, which was white, would by a bare Agitation be diſſolved in fair Water, and make it appear of the ſame Colour almoſt like Milk. *Spirit* of *Nitre* made juſt ſuch another whitiſh *Coagulum* as the *Aquafortis* did: From whence I ſhall hereafter endeavour to give the Reaſon why taking Cold and the Injuries of the Air are ſo frequently the Occaſion of the Gout and Rheumatiſm.

Vinegar, Spirit of Salt, of Vitriol, Oil of Vitriol and of Sulphur, in ſome Mucilage which I tried it with, did not make any conſiderable Alteration when it was cold, but in ſome other it did more; whereas *Aquafortis* and Spirit of *Nitre* did produce in all the ſame Effects in the ſame Degree. And here I could not but admire to ſee, that ſo ſtrong an Acid as the Oil of Vitriol ſhould produce no greater Alteration in it, not even ſo conſiderable as that of Vinegar; which makes me conjecture, that this Change in the mucilaginous Liquor in our Bodies is not always owing to the high Degree of Acidity, but that there is ſomething peculiar in Wines which produces the Coagulation of this Liquor in thoſe Interſtices where they have the Mucilage ſingly to work upon. Hence it is that we ſee that the Paroxiſms of the Gout are ſo frequently produced by the Uſe of Wines, where the Tone of the Glands is weaken'd, and the Patient has a Diſpoſition to this Diſtemper; which alſo agrees with thoſe Trials I have made with ſome Wines.

For Claret, White-wine, and even Sack, (but the Claret eſpecially) turn'd the Mucilage into a *Coagulum* like a Jelly, but the Claret, which has both an acid and a ſtiptick Quality in it, made the greateſt Coagulation. A mercurial Water made of Sublimate and *Aqua Calcis* made a very conſiderable whitiſh Coagulation as thick as a Jelly, which over the Fire turn'd to a Curd and a *Serum*. A Solution of *Roman Vitriol* alſo produced a Coagulation, as did that of *Alum*, but it made a greater Alteration in ſome than in others, though the Mucilages were taken from Subjects of the ſame Species. *Saccharum Saturni* made a true *Coagulum* with it, which over the Fire produced a diſtinct *Serum*; but the *Sal Abſynthii* made no ſenſible Alteration, only it ſeemed a little thicker; but ſo ſoon as I put into it ſome of the Decoctions of Galls, it produced a Coagulation. Then I dropp'd in ſome Spirit of Vitriol, to try what would be the Effect of the Colluctation of the *Sal* and Spirit, and found, after the Effervescency was over, that the *Coagulum* and the ſerous Part were ſeparated, and the *Serum* as limpid as Water.

I then took ſome of the Decoction of Galls, and mix'd it with ſome Spirit of Vitriol, intending to make a ſtrong acid Auſtere. When I obſerved that theſe Two by themſelves produced a Coagulation, I ſtirred them together, to ſee if the Whole might not be brought to mix by that Means, and found the *Coagulum* turn'd into a viſcous Body, and a perfect ſoft Gum. Then I took out the Gum, and poured ſome Mucilage to the refiduous Liquor, by which it was changed ſo as to aſſume a whitiſh Colour, but without any conſiderable Coagulation, becauſe the auſtere Parts were moſt of them, with ſome of the acid, precipitated into the Gum, which I had taken from the ſerous Part: But if the Spirit of Vitriol and the Mucilage are mix'd firſt, and the auſtere Liquor be added afterwards, they make a conſiderable Coagulation, which will not be diſſolved in Water, but only be broken in ſmall Parts. *Aquafortis* and the Decoction of Galls being both dropp'd into the Mucilage, made a white *Coagulum*, which would not diſſolve in Water, but very well with the *Oleum Tartari per Deliquium*, as alſo with the Spirit of *Sal Armoniac* dropp'd into it. I alſo found that the Infuſion of Red Roſes, *Balauſtia*, *&c.*

being mixd with ſome of the Mucilage, to which an Acid had been put, made the *Coagulum* the more firm, ſo that it would not diſſolve in fair Water; but the *Sal Tartari per Deliquium* and the Spirit of *Sal Armoniac* did the Work effectually in all of them.

The *Coagulum* of the Mucilage made with an Acid and the Infuſion of the *Peruvian* Bark, and ſeveral other Adſtringents, I dried, which when they were firſt put to the Teeth, ſeemed a little gritty, but after they were moiſt, became to be of a ſofter Nature. And here I cannot but take particular Notice, That all the Mixtures made of the Mucilage with an Acid and an Auſtere, produced not only a plentiful Coagulation of a whitiſh Colour, but ſuch a one alſo as was of a thicker Conſiſtency, and would not be diſſolved in Water, as that was which was made with an Acid only, becauſe this Obſervation will ſtand me in very good Stead hereafter, when I ſhall come to explain the Manner how the *Tophi* are produced in a nodoſe Gout.

The Fifth Diſcourſe of the Cartilages, *and their Uſe. Read* Auguſt 13. 1690.

I Am now come as far as the Cartilages, which though they cannot be called Bones, yet are they ſo near allied to them, that it is no Wonder to find them turned into Bones. I will carry on my Diſcourſes with thoſe Obſervations I have made of them, and with the Account of their Nature.

In ſome Fiſhes all the Bones (if ſo they may be called) are no more than Griſtles; and even in Man, the moſt perfect of all the Animals, there are ſome of them that continue cartilaginous for a conſiderable Time after the Birth, and are by the ordinary Courſe of Nature converted into Bones; beſides what preternatural Mutations of them have been obſerved, as of the *Aſpera Arteria*, of the *Cartilago Enſiformis*, and ſome others, into Bones. So in Oxen, Horſes, and ſome other Beaſts, this Mutation is not very rare in the Cartilages of the *Thorax*.

But notwithſtanding this Aptitude in the Cartilages to become Bones, there is a conſiderable Difference betwixt them: The Firſt is in their Subſtance and Conformation; for the Subſtance of the Cartilage is much ſofter, and the Parts of them more eaſily divided with a Knife. Neither have they any large Cavities as ſome, nor any ſpongeous Parts as all the Bones have. Beſides this, whereas that Part which makes the Sides of a Bone is the moſt ſolid, I have in ſeveral Cartilages obſerved the quite contrary, *viz.* that the exterior Part was the ſofteſt and the moſt flexible.

Secondly, They differ from the Bones in their Flexibility, being more apt to be conformed to thoſe Figures which any Force that bends them would oblige them to, than the Bones, which being rigid, are alſo more tenacious of their Figure.

The Reaſon of this Difference in the Flexibility is to be look'd for in the Union of their Particles, which in a Bone are at their Extremities ſo united in every Series, as to form a continued and an entire String; and when Inflexion obliges the Extremities of ſome Particles either to recede, (as where the convex is elongated) or to approach nearer to one another, (as when the concave is ſhorten'd, conſequently that Body in which they are ſo united that they can do neither, muſt be rigid and unflexible.

The Flexibility of the Cartilages, as well as in all other flexible Bodies, is owing to the Poſition and Figure of all, or at leaſt ſome of their Particles, as well as from the Diſunion and Diſtinction of their Extremities, which are of a long Figure, and have a ſtreight Poſition; ſo that one Extremity looks towards one, and the other towards the other End of the Body which they are the Parts of.

Beſides this ſtreight Poſition of the Particles, and the long Figure, a certain Order is obſerved in the Diſpoſition of them, which is ſuch, that the Extremities of thoſe in one Series do not terminate juſt where the Extremities of the Particles which are in the Series next to them do, but they lie beyond them, and reach to ſome intermediate Part between the Extremities of thoſe Particles which lie next to them laterally, as I have expreſſed in the Third Figure, *Table* II. For as the Extremities of the

the Particles in a flexible Body muſt be diſtinct, and their Figure ſuch, that thoſe which lie in one Series may be capable of moving and ſliding upon them which are contigous to them in the next; ſo muſt their Poſition and Order be ſuch, that they may ſlip, and the Extremities of their Particles may not only approach nearer to, but recede alſo from one another without interrupting the Continuity of the Body. For want of the firſt, the Body would be inflexible; and from a Deficiency in the other, it would be broken upon being bent, when any Part is elongated.

But according to theſe Suppoſitions we may ſoon conceive, how a flexible Body may be inflected without a Diſſolution in the Continuity of it, even when the Convex Part is lengthened, and the Extremities of the Particles recede one from another. Where they are driven cloſer together, 'tis true there is no Reaſon to imagine, that a Fracture ſhould be the Conſequence of an Inflexion, tho' the Extremities do not lie in this Order. But in the bending of all Bodies, there is doubtleſs a Lengthening on one Side, even when the other is ſhortened; and ſuppoſing the Alteration which is made in the Poſition of their Particles to be by their Recedure, yet ſtill the Body will be as Proof againſt a Fracture, and as capable of ſuffering a Flexure without any Injury, whilſt the Order of its Parts is ſuch as I aſcribe to them. As ſuppoſe in *Fig.* IV. *Tab.* II. *a*, *a*, *a*, *a*, to be Four Series of Particles lying contiguous to one another, laterally, and making one Body; ſuppoſe thoſe of the Firſt and Third Series, which have their Termination about the middle Part of them which lie next to them in the Second and Fourth, to be moved, and to ſlide at one End towards *b*, and in the other Part towards *c*, ſo as to elongate the whole Body, we may apprehend how they may move both Ways, and ſlip upon the Particles which are laterally contiguous to them, without any Prejudice to the Continuity of the whole; and until they come as far as *d*, or the Interſtices betwixt the Extremities of the Particles in the Second and Fourth Series, there will be no Fracture: But when they are forced ſo far, that one of their Extremities is brought to thoſe Interſtices, there muſt of Neceſſity follow a Diſſolution of the Continuity. And this is the Reaſon why a Body, when it is too far bent, breaks; and why it is broken firſt of all in the convex Part: For on that Side is the Recedure of the Particles, and the nearer they lie to the Superficies there, the more conſiderable it is, and conſequently they are firſt brought to the Interſtices between the Extremities of theſe Particles, which lie next to them laterally.

Not that all the Particles in every flexible Body obtain ſuch a Poſition, or that every one of them that lie in the ſame Series, are capable of receding from or approaching nearer to one another; but there are ſo many of them as anſwer to the Degree in Flexion, that the Body is capable of without a Diſſolution of its Continuity. And according to the Number and Proportion of the Particles that are of a ſtrait Figure, and of ſuch a Poſition, and according to the Length of them, and the Diſtance of their Extremities in one Series, from the Extremities of thoſe that are contiguous to them laterally, the Body is adapted to be more or leſs inflected without breaking.

Beſides the Flexibility, the Cartilages have alſo ſome Rigidity, and a Power of Recoiling when they are bent. This is very evident in the *Epiglottis*, which tho' it is not ſo rigid as ſome other Cartilages, nor has any Muſcles to pull it up, yet does, after it has been depreſſed by the deſcending Food, riſe again by its own innate Virtue of Recoiling, or Reſtitution into its natural Poſition, which Recoiling may be obſerved in it after the Animal is dead, when it is preſſed down upon the *Rimula* of the *Larynx*.

This Reflexion ſeems to owe its Origin to the Air; ſometimes to the Preſſure of the external Air, ſometimes to an *Aer inſitus* included in the Interſtices of the Body it ſelf, but moſt commonly to both. I have told you, that in a flexible Body the Extremities of the Particles ſhould be diſtinct; ſo that we muſt rationally conclude, that there are ſome Interſtices between them (which in many Bodies which are rigid are very diſcernable) in which there is an Air included, or as it were impriſoned, which is indued with an Elaſticity or Spring, as is

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apparent by many Experiments. Whatever preſſes upon this Spring, and as it were winds it up beyond its ordinary Reach, will cauſe a Renitency in it, and an Endeavour to expand it ſelf; and this Reſiſtance of the Air, when it is crowded into a narrower Space than is conſiſtent with its Nature, gives a recoiling Body the Power of Reſtitution, *i. e.* to return to its former Figure after it is bent; ſo that the Interſtices within it regains their natural Capacity, and the Air which was compreſs'd recovers its Liberty of Expanding it ſelf.

For when the concave Part of any rigid Body is ſhortened whilſt it is bent, and the Extremities of the Particles are preſſed nearer to one another, the Interſtices between them muſt of Neceſſity become leſs; and ſo the Air contained within them will be compreſſed, and the Spring, as it were, wound up. The natural Conſequence of this Compreſſion will be a Renitency in the Air, or an Endeavour to reſolve the Particles to that Poſture, and the whole Body into that Figure which is moſt capable to reſtore the natural Capacity of the Interſtices, which was proportioned to the Quantity of Air included within them. This Strength and powerful Reſiſtance of the aereal Spring is evidently ſeen in a Wind-Gun, where a greater Quantity of the Air being forced in than the Space which is to incloſe it is capable of containing without a violent Compreſſion, and raiſing the Spring beyond its ordinary Height, exerts its Elaſticity with an uncommon Force, when the Gun is diſcharged, and the Air has the Liberty of relaxing its Spring by its ſudden Dilatation.

But when the convex Part of a recoiling Body is elongated, when the Extremities of the Particles on that Side recede from one another in Inflexion, then the Preſſure lies not upon the Air which is within the Interſtices of the Body, but upon the external Air: For as much as the Interſtices between the Extremities of the Particles are inlarged, ſo far the Body incroaches upon the Atmoſphere; and ſo long as the external Air is excluded, and has not the Liberty of filling up what is added to the Capacity of the Interſtices, there is nothing to anſwer that Space which the *Atmoſphere* loſes; ſo that the external Air muſt neceſſarily be compreſſed, and the Spring of it heightened, and this muſt needs introduce an Endeavour to force back the Particles of the inflected Body into their natural Poſition, and to reſtore the Interſtices to their former Capacity, which is not to be done without the reducing of the Body to a more ſtrait Figure.

An Effect of this Nature, from a Preſſure upon the external Air, we have formerly ſeen here, in an Experiment made by Monſieur *Papin* before the *Royal Society*, performed with a Barrel of a Gun, adapted to the Air-Pump. In this Experiment, the Air being exhauſted out of the Gun, and obtruded upon the external Air, and the external Air being excluded from the Cavity of the Barrel, ſo that it could not obtain any Space to anſwer for that which the evacuated Air then occupied, it was compreſſed, and the Spring of it conſiderably heightened, which afterwards appeared, when the Breech of the Barrel was opened, and the external Air had the Liberty of expanding it ſelf; for it ruſhed in with that Violence, and exerted the Power of its Spring with ſo much Vigour, as to ſhoot the Bullet with which the Gun was charged, with an exceſſive Violence.

I thought fit to inſiſt the longer upon the Nature of flexible Bodies, and to explain the Reaſon why thoſe that have a Rigidity to recoil, not only to convince you how the Cartilages may be bent without breaking, and to ſhew their Endeavour to return to their natural Figure after they are bent, but becauſe it was my Deſign alſo, that what has been ſaid concerning the Flexibility and the Power of Reſtitution, which are in ſome Bodies, ſhould ſerve in Part as an Account of the Nature of theſe Parts of the Particles which they conſiſt of, and of the Order in which their Particles are diſpoſed. Therefore to make a particular Application to what has been ſaid, concerning the Nature and Parts of a flexible and recoiling Body to the Cartigages, the Figure of their Particles is long, and they are ſmooth, their Poſition is ſtrait, their Extremities diſtinct; betwixt there are Interſtices which contain an included Air. The Particles are diſpoſed in a certain Order; ſo that in every Series they reach with their Extremities to ſome intermediate Part, or near to the middle of thoſe

thoſe which are next to them laterally, and lie quite over the Interſtices which are formed between the Extremities of thoſe on their Sides, whereby the Interſtices are incloſed, and the Air contained in them is ſtraitly impriſoned.

This may lead us unto the Difference between a Bone and a Cartilage; to wit, in one the Particles are united at their Extremities, ſo that every Series makes one continued String; whereas in the other they are diſtinct, and there are little Diſtances between their Extremities, ſo that in every Series they are capable of being brought nearer to, or driven farther from one another. And therefore the Alteration that a Cartilage undergoes when it becomes a Bone conſiſts in this, that the Particles at their Extremities receive ſuch an Addition of Nouriſhment as to touch one another there, till they unite and acquire a Continuity, which makes them in every Series form a compleat String, when the implanted Air has a Paſſage out of the Interſtices, and gives Way to that Nouriſhment whoſe Acceſſion it did before reſiſt. By this Union of the Particles the Temper of it is altered, and it being difficult to part them, it grows firm and inflexible.

Whilſt the Cartilages continue in their natural Conſtitution, the terreſtrial and fix'd ſaline Parts are much leſs in Proportion to the other Parts than they are in a Bone, there remaining after Calcination not above a Fifteenth Part.

The Cartilages have a Membrane as well as the Bones, which ought to be called a *Perichondrium*, tho' in Effect it is a Continuation of the *Perioſteum*, conſiſting of the ſame Sort of Threads, being of the ſame Contexture, and ſo agreeing with it in all Reſpects, that I need not enter upon a particular Deſcription of it. Neither does the Uſe and Deſign of the *Perichondrium* differ from them of the *Perioſteum*; for it inveſts the Parts, and helps to limit their Accretion. It alſo ſupplies the Defect of Nerves in them, gives them a Senſation, and ſupplies to them thoſe Spirits which are inſtrumental in their Increaſe, and is a *Medium* whereby the Tendons of the Muſcles are fixed to thoſe Cartilages which have any of them inſerted into them, as thoſe of the *Larinx*, and ſome others. But in thoſe that are joined to the Bones, it is doubtleſs mainly inſtrumental in ſtrengthening their Conjunction: For tho' they are beſides this joined alſo by another Way, yet when this Membrane is taken off, or ſeparated round that Part where they meet, they are eaſily divided aſunder.

For the better ſtrengthening the Adheſion of the *Perichondrium* to the Cartilages, and conſequently to make the Conjunction of the Bones and Cartilages which are united, and the Union of any Part that belongs to them, the more firm, they have little ſuperficial Furrows and Pits, ſo to inlarge their Superficies where their Membrane adheres to them, which it does partly by Contiguity, which Manner of Union is ſo much the more firm, as the Surface where two Bodies do immediately touch one another is larger; and therefore the *Perichondrium* has on that Side which is next to the Cartilage Inequalities and Prominencies exactly adapted to, and filling the ſuperficial Cavities of the Parts which it adheres to.

Beſides this, the *Perichondrium* is united to the Cartilages by ſmall *Fibrillæ*, or Threads, which enter ſome Way into their Subſtance, as thoſe of the *Perioſteum* do into the Bones. By theſe are ſupplied the Spirits that ſerve in their Accretion, and by whoſe Mediation we may reaſonably ſuppoſe, that the Cartilages have ſome other Senſation than what is barely in their Membrane.

Neither are they deſtitute of Blood-Veſſels, notwithſtanding they are ſo exceeding white, but are furniſhed very plentifully with them. I have obſerved in the ſingle Cartilage *Thyroides* ſome Hundreds of Pores, by ſome of which ſome of theſe Veſſels paſſed into it, as by ſome others of them others had their Egreſs. All theſe ſerve only for their Accretion and Nutrition.

But the Cartilages ſeem not to have any Medullary Oil ſeparated within them from the Arterial Blood; for tho' it is plain that they want ſomething of that or the like Nature, and tho' when I have traced the Blood-Veſſels, which commonly run along in the Middle of thoſe Cartilages that are of a long Figure, ſo far as that Part where I judged they had their Termination, I have ſometimes diſcovered a certain oleagi-

nous Subſtance beyond it, but after all was not able to find out any Veſicles or Glandules by which it might be ſeparated; ſo that it ſeems as if this oily Matter was ſupplied from the ſame Bone to which it was united. In my Account of the Marrow, I ſuppoſed ſome of the Medullary Oil to be deſigned for the Uſe of the Cartilages where they are joined to the Bones; and I have obſerved that there are Pores which in all Probability muſt be the ſame by which this Medullary Oil is communicated from one to the other.

For the better Conjunction of the Cartilages with the Bones, where they are united with them, (beſides the Service they receive from their Membrane) the Bones are formed in that Part which is applied to them, with certain conſpicuous Prominencies, or ſhort and obtuſe Roots, and other ſmaller Radicles, which are both numerous and placed thick together, as well in thoſe Prominencies as in the other Parts of that Extremity of the Bones by which they are a little Way ingrafted into the Cartilages.

Of the Uſe of the Cartilages.

THE general Uſe of the Cartilages is eaſily underſtood. It muſt be conſidered, that there are certain Parts of the Body which require a greater Strength and Solidity than was conſiſtent with the Fibres or Ligaments; as they are requiſite for the Defence of ſome tender and noble Parts, or for the Dilatation of ſome Paſſage, to keep it diſtended, and to reſtore it to its natural Capacity, after it has been compreſs'd and ſtraitned; and yet withal it was no leſs neceſſary that they ſhould be more flexible than the Bones, that they might alter their Figure when the Motions and Actions of ſome of the Parts which they either protect or are united, or adjacent to, do require it. Now to make a Part both ſolid and flexible, and capable of anſwering both theſe Ends, Nature has framed the Cartilages, which are of a middle Conſtitution, between a Bone and a Ligament; for they partake of the Firmneſs and Rigidity of the one, and of the Flexibility of the other; and are employed wherever a firmer Part than a Ligament, and a more flexible Subſtance than a Bone, is required. And it would be no hard Matter to ſhew, how all Parts of this Temper are ſerviceable in every Part where they are placed; but I judge it ſuperfluous; becauſe every one, upon taking a View of them, and the Parts they are appointed to, may at the ſame Time ſoon ſatisfy himſelf in this Point: Therefore I will only communicate to you my Thoughts concerning the particular Uſe of the Cartilages which are united to the Ribs, becauſe the Manner in which they are ſerviceable to Reſpiration ſeems to be not very well underſtood.

'Tis obvious to every one, that if the *Walls* of the *Thorax* had been made fibrous, and Nature had not ſeated two of the main Engines of Life within a ſolid Defence on both Sides, they would have been expoſed to external Injuries and Preſſures. At the ſame Time it was highly neceſſary alſo, that the Action of Reſpiration ſhould not be interrupted; ſo that there was an abſolute Occaſion for ſuch a Contrivance, that it might not be impaired by the Structure and Nature of the Parts that encloſe the Cavity of the *Thorax*. For if the Cartilages of the Breaſt had been only Ligaments, or elſe Membranous, the Heart and Lungs muſt have been expoſed to external Violences; and if they had been all Bones, that Bone which is between the *Sternum* and the *Vertebræ* of the *Spine* had been unfit for an Elongation, which is, doubtleſs, the Thing that was deſigned by Nature when ſhe made ſome Part of it cartilaginous, that by reducing of that Part to a more ſtrait Figure, the *Vertebræ* as well as the Breaſt-Bone may be protruded.

The moſt ingenious Dr. *Mayo* has explained to us, how the Ribs do contribute to the Enlarging of the *Thorax*, by the Alteration of their Poſition; and being raiſed from that Place which ſeparates and divides the Cavity of the Breaſt into two equal Parts, towards which they did before incline, be it the *Mediaſtinum*, or be it imaginary: So that whereas before they made Acute, they come to form Right Angles with that Plane; for the Ribs are not articulated with the Spine and Breaſt-Bone at Right Angles, but at Acute Angles: And he ſuppoſes the Cartilages to be joined to

them to increaſe their Length, and augment the Concave of the Bow. And it is demonſtrable, that if ſeveral incurvated Bodies, ſuch as the Ribs are lying upon or inclining to a Plane, be ſo raiſed as to reſt upon their Extremities, and to make Right Angles with that Plane, they will form a large Cavity under their Arch. But if this had been the Deſign of the Cartilages, this might have been effected as well by the Ribs, if every one of them had been one continued Bone from the *Sternum* to the *Vertebræ*.

'Tis therefore my Opinion, that the Cartilages were deſigned to make the Ribs more capable of altering their Figure, and ſo to contribute another Way alſo to the Dilatation of the Breaſt; and conſequently to the Capacity of the Breaſt in Inſpiration: And I dare aſſert, that they have likewiſe their Share in the Contraction of it, when the Air is forced out of the Lungs again.

My firſt Aſſertion is, that the Cartilages aſſiſt in inlarging the Concavity of the *Thorax*, not only by being raiſed from the Plane towards which the Ribs incline when the Air is evacuated, but by altering their Figure when they move upwards towards the Clavicles. For if we well examine the Inlargement of the Breaſt in the Inſpiration of the Air, we ſhall find its Capacity augmented by the Addition of ſomething more than what can well be expected from the Elevation only of the Ribs; and it will be apparent to any one that makes an exact Obſervation of it, that the *Vertebræ* of the *Thorax* are driven outwards, and the *Sternum* (tho' not ſo ſenſibly) is protruded when we draw in the Air, which cannot proceed from the Elevation of the Ribs, and their forming Right Angles with the Plain from which they are raiſed. For tho' this makes an Ampliation of the Cavity of the Breaſt in that Part which is under their Arches, yet does this Elevation alone make no Alteration in their Length, without which they can't thruſt outwards both theſe Parts that are united to their Extremities at the ſame Time; for ſo long as the Diſtance between their Extremities is the ſame when they are drawn up towards the Clavicles as when they deſcend, this Alteration of their Poſition only can't protrude the Parts that are joined to their Extremities.

The Protruſion therefore of the *Vertebræ* and the *Sternum* in Inſpiration, muſt preſuppoſe ſuch a Change of the Figure in ſome Part of the Ribs when they move upwards, as makes an Addition to the Length of the whole. Let us therefore obſerve the Figure of the Cartilages that are joined to the true Ribs; that is a Sort of an Angle; ſo that as this Angle is more or leſs obtuſe, the extreme Part both of the Rib and Cartilage recede farther from, or come nearer to one another; ſo that when the Ribs deſcend and incline towards their Plane, and their Cartilages obtain their natural Figure, this Angle, as it is always ſo obtuſe, comes nearer to a Right Angle; but when they aſcend, it is more obtuſe. And as the Alteration of their Figure in Inſpiration, and the Reſtitution of it in Expiration, require their Flexibility; ſo I have obſerved theſe Cartilages to have continued cartilaginous and flexible where this Angle has been, when the reſt of the Cartilage has been of an oſſeous Nature; which confirmed me in my Opinion, That this angular Part of them is peculiarly deſigned for their Elongation at that Time when we draw in the Air. Now it is demonſtrable, that as an Angle becomes more obtuſe, and approaches nearer to a ſtrait Line, the Diſtance between the two lateral Lines which form it muſt be increaſed; ſo the Angle of the Cartilage being rendered more obtuſe by the Contraction of the Intercoſtal Muſcles, and being reduced nearer to a ſtrait Figure when the Ribs are raiſed, their Extremities muſt needs recede from another, and ſo protrude the *Sternum* to which they are joined at one Extremity, and force back the Ribs which are joined to the other, and by their Means thruſt back the *Vertebræ*.

If this angular Figure of theſe Cartilages were not deſigned to add to the Capacity of the Breaſt by the Protruſion of thoſe Parts, but only to encreaſe the Cavity or Arch under the Ribs in their Elevation, I can ſee no Reaſon why Nature ſhould make this Difference between their Figure and that of the Ribs, and had not rather given them both the ſame Obliquity, ſo as to make but one continued exact Bow of them both. And why has Nature fill'd up ſome Part of the Diſtance between the

Vertebræ and *Sternum* with ſuch a flexible Subſtance as the Cartilages are, if it were not to make it capable of an Elongation? When if every Rib had been one continued Bone to the *Sternum*, without any Cartilage adjoining to it, it had with an Articulation at the *Sternum*, been as well diſpoſed to move upwards towards the Clavicle, and would have formed the ſame Arch as it does with it, if we ſuppoſe no Alteration in the Figure of the Part.

The Second Thing I have attributed to theſe Cartilages, is their being aſſiſting to Expiration. To prove this Aſſertion, it muſt be conſidered, that they obtain their proper Figure, and their Parts remain in their natural Poſition when the Breaſt is contracted; and conſidering that there cannot be ſuch an Alteration in the Figure of the Cartilages, as renders their Angles more obtuſe than naturally they are, without the ſame Diſturbance to their Particles, and the ſame Alteration in their Pores, or the Interſtices between the Extremities of the Particles, as there are upon the Inflexion of any rigid Body, (for what Inflexion is to a Body that is ſtreight, the ſame is Extenſion to a Body which is crooked) therefore there muſt be of Neceſſity a Preſſure upon the Spring, either of an internal included Air, or of the external Air, as the convex is ſhorten'd, and the concave is lengthen'd: For in the Extenſion or Reducing of an oblique Body nearer to a ſtreight Figure, different from what it is in the Bending from one that is ſtreight when there is an Elongation, it is on the concave, and the Abbreviation is on the convex Part.

Theſe Cartilages therefore having from the Air a Power of Reſtitution, will, when their Figure and the Capacity of their Pores are ſo altered as to make a Preſſure upon it, recoile, and return to their Firſt Figure, without the leaſt Aſſiſtance of any Muſcles, as it is obſervable in the *Epiglottis*, which is not ſo rigid as theſe. 'Tis this Power of Reſtitution that is the Cauſe of a Subſidence both in them and in the Ribs, whereby they contract the Cavity of the *Thorax*, and by making a Preſſure upon the inflated Lungs, contribute to the Expiration of the Air which diſtended them. And this is one of the main Reaſons why the *Thorax* is contracted in all dead Bodies; for it cannot be ſuppoſed to proceed from any Action of the Muſcles which are ſubſervient to Expiration, unleſs we will ſuppoſe them alſo to the laſt that act, which it is not very probable they ſhould, ſince we have much better Reaſons to believe, that the Inſpiratory Muſcles are the laſt of all theſe that contract themſelves.

But let 'em be which they will, 'tis certain that after Death neither of them can modifie the *Cavity* of the *Thorax*, either by Contraction or Diſtention; whereas if the Lungs are then inflated, and the *Thorax* is diſtended, ſtill it afterwards contracts it ſelf. 'Tis true, this may in ſome Meaſure be aſcribed to the Subſidence of the Veſicular Subſtance of the Lungs; nevertheleſs if it be conſidered, that the Reſitiency of theſe Cartilages, when they are extended, ariſing from the Elaſticity of the Air, without any Dependance upon the Animal Spirits, the Power remains the ſame when the Body is dead at it was before; and that they have ſtill a natural *Conatus* to return to that Figure, which they cannot obtain without the Depreſſion of the Ribs, and the Contraction of the Breaſt, we may very well ſuppoſe, that this is one Thing that determines the Poſture of the one, and the Figure and Capacity of the other, after Death.

The End of the Firſt Volume. A

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MVSEVM
BRITAN
NICVM

FINIS.